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THE UNIVERSITY OF ALBERTA

THE INFORMATION SEEKING BEHAVIOR OF UNDERGRADUATE STUDENTS IN AGRICULTURE AND FORESTRY AT THE UNIVERSITY OF ALBERTA

by

KATHARINE ALIX HAYDEN

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF LIBRARY SCIENCE

EDMONTON, ALBERTA
FALL, 1988

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K. Alix Hayden

9 Braeside Crescent
Sherwood Park, Alberta
T8A 3N1

Date: August 12, 1988

Knowledge is of two kinds:
we know a subject ourselves
or
we know where we can find
information upon it.

Samuel Johnson, 1775

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "The Information Seeking Behavior of Undergraduate Students in Agriculture and Forestry at the University of Alberta" submitted by Katharine Alix Hayden in partial fulfilment of the requirements for the degree of Master of Library Science.

A M Schrad ....
(Supervisor)

....

....

Date: August 12, 1988 ....

DEDICATION

This thesis is dedicated to the memory of my brother Kieran, whose mathematical mind could not understand why someone would need a masters degree in order to put books on shelves.

ABSTRACT

The purpose of this study was to identify and compare the information sources that first-year and fourth-year undergraduate students in the Faculty of Agriculture and Forestry at the University of Alberta, choose to satisfy their academic information needs. In addition, the study investigated the relationship between specific psychological needs that influence undergraduate student information seeking and the information sources chosen by them to satisfy those needs.

Data were collected from two major sources: a questionnaire and critical incident interviews with self-selected volunteers. The questionnaire sample was comprised of 57 first-year students and 69 fourth-year students. This sample represented 40 percent and 47 percent of the total enrollment of first and fourth year students respectively. Twenty-two students, 11 from each year, participated in the interviews.

The data suggest that the type of course requirement influences the choice of information source. Students tend to choose a formal source, such as a library, for term papers and seminars, and an informal source, such as a teaching assistant and friend, for labs and seminars. It was discovered that some of the information sources chosen by first-year and fourth-year students differ significantly; however, the university library was considered to be the most important information source by the majority of students in the study. In addition, information sources were chosen mainly because of pragmatic reasons, rather than psychological.

Implications for further research, for librarians and practitioners are also presented.

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My thanks to Dr. Alvin Schrader for supervising this work. Appreciation is also expressed to Dr. Shelia Bertram and Dr. Mick Price who served as committee members, and to Chris who was always available to offer assistance with statistical problems.

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CHAPTER I

STATEMENT OF THE PROBLEM

A. THE PROBLEM

Agriculture and forestry have been, and continue to be, the most important primary industries in Canada, contributing major economic and social benefits to Canadian society as a whole. Research and development constitute the key to their continued progress.

Agriculture is founded on the purposeful management of living things -- plants, animals, and microorganisms. It is a multidisciplinary mission-oriented science. Research results are applied to existing knowledge for the direct and immediate solution of problems. Agriculture has become a large and complex industry concerned with the production, processing, transportation, and marketing of agricultural products. New concepts and technologies are rapidly evolving and changing. Research is the link to social benefits.

Forestry is the "science, business, and art of managing and conserving forests and associated lands for continuing economic, social and environmental benefit" (Science Council of Canada, 1973, p. 22). It involves the management of forested lands and wildlands for the variety of uses and products that may be derived (Murphy, 1983). Forest land managers are concerned with the use of quality forest lands for agricultural and other non-forestry products. As forest land is reduced, future forest production will have to be met from a smaller land base of lower quality. Research and development efforts have focussed on forest renewal and protection. In recent years, the federal government of Canada has begun to coordinate and strengthen forestry research and develoopment at the federal and provincial levels, in the private sector, and in

Canadian universities. It has also begun to improve the level of support for technology transfer (Government of Canada, 1985).

Issue by issue examination of the *Quarterly Bulletin of the International Association of Agricultural Librarians and Documentalists* (IAALD) reveals that research has been conducted on the importance of effective dissemination and transfer of forestry and, more especially, agricultural information. For the most part, the research has focussed on information transfer through the printed medium and through online databases in developing countries. Few investigators have concentrated on agricultural and forestry information transfer in North America. In addition, researchers have not investigated the importance of informal communication networks in the agriculture and forestry fields, or in the education of students in these fields. These areas require further study.

Almost two decades ago, Brittain (1970) urged librarians and researchers to stay away from traditional user surveys. He maintained that:

> theories of information-processing that will generate propositions concerning channel selection; amount of seeking; effects on productivity of information quality, quantity, currency, and diversity; the role of motivational and personality factors, etc. are required (p. 17).

Brittain also suggested that there may be a relationship between psychological variables and information requirements, needs, and uses.

More recently, Wilson (1981) contended that past information seeking behavior studies have not addressed the central question of "why the user decides to seek information, what purpose he believes it will serve, and to what use it is actually put when received" (p. 7). He noted that research has focussed primarily on pragmatic issues, such as determining the effectiveness of existing information systems, and providing guidance on aspects of information systems design, development and operation. He argued that data were still needed on the reasons that people seek information.

These reasons, Wilson pointed out, are a reference to need. As he defined it, need refers to the concept of human needs and can be divided into three categories:

1) physiological needs - food, water, shelter, for example,
2) affective needs, that is, psychological and emotional needs - need for attainment, for domination, for example, and,
3) cognitive needs - need to plan, to learn a skill, for example (p. 7).

These categories of needs are interrelated and may motivate an individual to seek information in order to satisfy them. Wilson suggested that "it may be advisable to remove the term 'information needs' from our professional vocabulary and to speak instead of 'information-seeking towards the satisfaction of needs' " (p. 8). Wilson also suggested that the channel, or source, of information, may be guided by psychological needs as much as, if not more than, by cognitive needs.

It is necessary, therefore, from the information specialist's point of view, to be able to identify and understand the variables that influence information seeking behavior (Brittain, 1970). The present study addressed this question by focussing on the psychological needs which are motivating factors in the search for information. As Fine (1984) has observed "it is not enough to know *that* people behave as they do, we also need to understand *why* and *how* if we are to attempt to solve problems whose origins are in human behavior" (italics in original, p. 457-458).

The importance of this theoretical perspective for research into information seeking within the fields of Agriculture and Forestry is just as vital as for any other discipline, whether pure or applied.

B. PURPOSE OF THE STUDY

The purpose of this study was to identify and compare the information sources that first-year and fourth-year undergraduate students in the Faculty of Agriculture and Forestry at the University of Alberta chose in order to satisfy their academic information needs. In addition, the study investigated the relationship between specific psychological needs that influenced undergraduate student information seeking and the information sources chosen by them to satisfy those needs.

C. RESEARCH QUESTIONS

The study was designed to provide answers to the following questions:

1) What information sources do first-year and fourth-year undergraduate students in the Faculty of Agriculture and Forestry choose to satisfy their academic information requirements?
2) What relationship exists between type of information source chosen by the students and type of course requirement?
3) What psychological needs influence first-year and fourth-year undergraduate students in the Faculty of Agriculture and Forestry to search for academic-related information?
4) What relationship exists between the information sources chosen by the students and their motivating psychological needs?
5) What influence does exposure to bibliographic instruction have on undergraduate students' choice of information sources?
6) What influence does academic institution have on undergraduate students' choice of information sources?

D. RESEARCH HYPOTHESES

These questions were more formally stated as research predictions. Therefore the study hypothesized that:

1) There is a relationship between the type of information source chosen by students and type of course requirements.
2) There is a difference between the information sources chosen by first-year and fourth-year students.
3) There is a difference between the motivating psychological needs of first-year and fourth-year students.
4) There is a relationship between the information sources chosen by students and their motivating psychological needs.
5) There is a difference between the information sources chosen by students who have been exposed to bibliographic instruction and students who have not been exposed to bibliographic instruction.
6) There is a difference between the information sources chosen by students and their academic institution of first year attendance.

The null forms of the above research hypotheses were tested and level of significance for rejection of the null hypotheses was set at $p < .05$.

E. DEFINITION OF TERMS

For the purposes of the present study, the following terms and definitions were used:

1) information sources - places, people, or materials to which respondents go to get the information they need (Matheson,1979, p. 15).
2) information seeking behavior - the processes of how and from where information is obtained (Hall,1986, p. 6).

3) information - all ideas, facts, and imaginative works of the mind which have been communicated, recorded, published and/or distributed formally or informally in any format (ALA Glossary,1983, p. 117).

4) psychological need - a mental force which directs a person's activities so as to change an unsatisfying situation or maintain and promote a desirable situation (Dunn,1984, p. 8).

F. LIMITATIONS OF THE STUDY

1) The results of the study may not be generalizable to students who have access to different library resources, community facilities, faculty structure, and course requirements than the students in Agriculture and Forestry at the University of Alberta.

2) The results of the study may be subject to students' attitudes towards and the degree to which they responded accurately to the questionnaire and interview. Self-reported behavior cannot be readily verified because of factors such as memory and recall.

3) The results of the study may not be generalizable to all undergraduate students in Agriculture and Forestry as only students in first and fourth years of their programs were studied.

4) Respondents may not be representative of nonrespondents.

5) The interview volunteers may not be representative of the general sample as they were self-selected, rather than randomly selected.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter discusses research related to the present study in the areas of: use and user studies, information seeking behavior, and psychological aspects of information seeking.

A. USE AND USER STUDIES

Use and user behavior is one of the most investigated topics in the literature of librarianship. As Burns (1978) has noted, use and user studies are central to any understanding of information system behavior. Some of the earliest studies of library use patterns were conducted in the 1930's and 1940's. The methodologies employed have evolved since then from tabulation of circulation statistics to more sophisticated attempts to examine the user-library interface.

Bibliographies, annotations and comprehensive literature reviews of the research in this area are available (Taube, 1959; Davis and Bailey, 1964; Atkins, 1971; Bates, 1971; Wood, 1971; Tobin, 1974; Ford, 1977; Smernoff, 1984). In addition, since 1966 the *Annual Review of Information Science and Technology* has included a yearly review of research on information needs and uses.

In 1980, the Collection Management and Development Committee of the Resources Section of the American Library Association formed a subcommittee to investigate and develop guidelines for conducting use and user studies. A document was prepared (Christiansen, Davis and Reed-Scott, 1983) with the objective to provide a summary of the research methodologies being used in collection evaluation studies. Advantages and disadvantages of each methodology were outlined. The Committee identified six use and user studies methodologies:

1) circulation studies,
2) survey of user opinions,
3) document delivery tests,
4) shelf availability studies,
5) in-house use studies, and
6) citation studies.

With the exception of surveys of user opinions and citation studies, these investigative techniques focus on the use of the library, rather than on the user. The Committee did not distinguish between use studies and user studies.

Broadus (1980) provided a distinction between the two types of research. He defined use studies as those that concentrate on library materials, attempting to determine what use, or how much use, they receive. A user study, on the other hand, focuses on people and asks whether, or how much, they use the library, its materials and resources .

Research must also focus on the user's demands and needs in order for the library's collection and services to reflect those demands and needs. Butler and Gratch (1982) identified the purpose for conducting a user study:

> In general terms, the purpose of a user study is similar to market research in business. It is an attempt to discover patterns of use and levels of awareness of users toward library services, to determine success or nonsuccess of services, and to identify what adjustments are needed in service strategy (p. 322).

Along with the purpose, the ultimate goal of the user study, according to Burns (1978), is "the discovery, articulation, understanding, influencing, and, when appropriate, the elimination or at least minimization of those obstacles between a user and his information goals" (p. 6).

Burns (1978) defined the three basic types of data that user studies require:

1) demographic data - parameters such as age, sex, race, education, socioeconomic level,
2) preferential data - parameters such as reading preferences, preferred visiting hours, and location,
3) behaviorial data - involves what actually took place.

User studies need to extrapolate the preferential data to include information source preference. They need to delve into the actual information seeking behavior of users. The present study addressed this issue.

B. INFORMATION SEEKING BEHAVIOR

The term "information seeking behavior" has been used in the research literature about scientists and researchers since the 1950's. The current emphasis on user surveys has prompted librarians to investigate the concept of information seeking behavior, drawing on models from the disciplines of psychology, sociology, and communication theory. Most studies, however, have concentrated on the means by which individuals find information rather than upon the ends served by the information seeking behavior (Wilson, 1981). Researchers have focussed on how people should be seeking information rather than investigating the actual demands that people make in order to satisify their perceived needs. Of importance is the environment in which the need is perceived. The information required must be in the context of the user's everyday life where the need is first perceived. Chen and Hernon (1982) maintained that

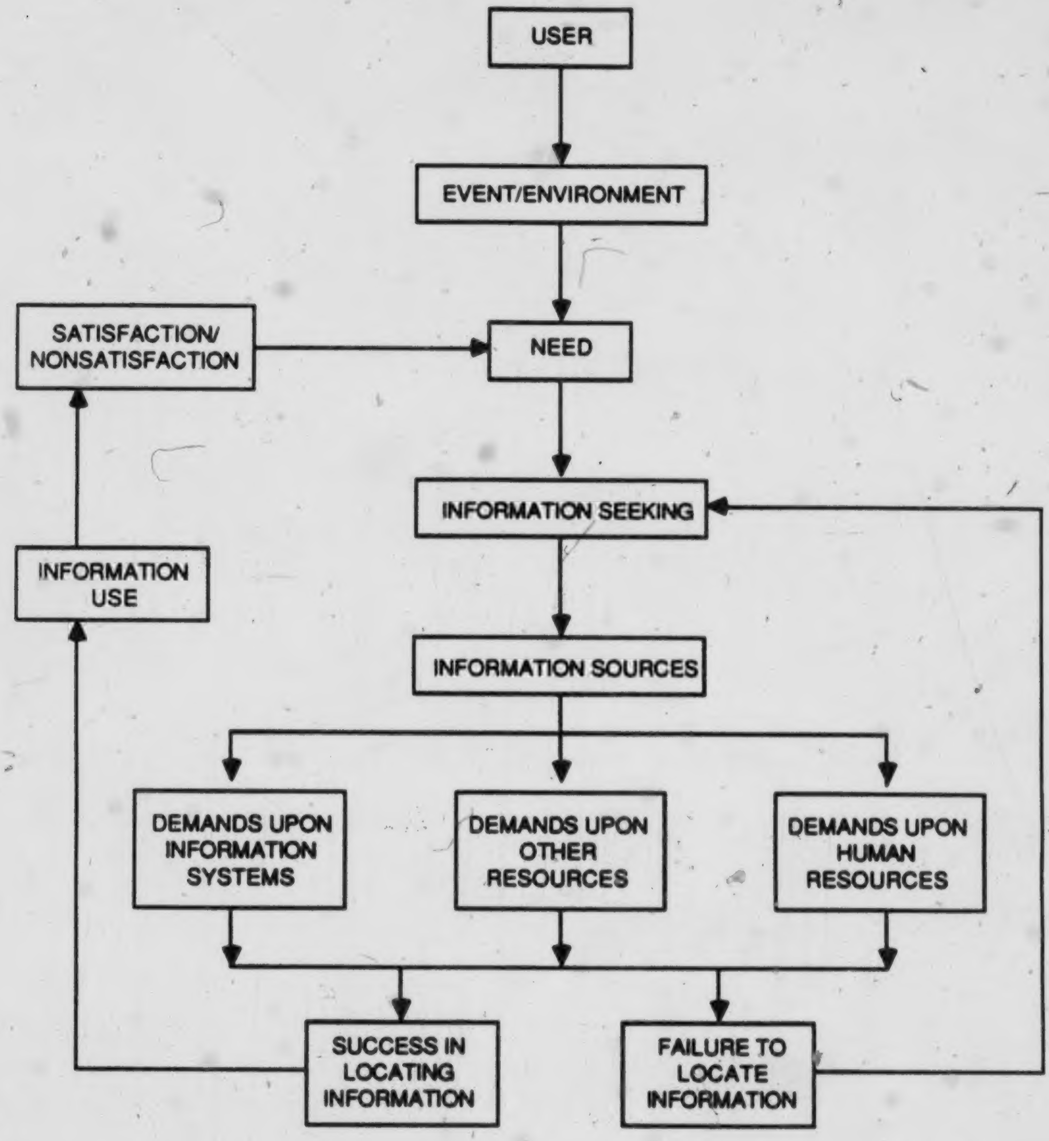
> any attempt to depict general trends and tendencies in information seeking must admit the human individual as the center of the

> phenomenon, consider his or her view, need, options, and prejudices as significant and influential elements deserving investigation (p. 6).

A view of information seeking behavior is illustrated in Figure 1. The diagram illustrates the relationships between the concepts of user, need, uses, and user behavior. It is adapted from Wilson's (1981) figure of "Interrelationships among areas in the field of user studies" and Krikelas' (1983) model of "Information seeking behavior".

The diagram suggests that the user perceives a need in the context of the user's environment. That is, in a given environment or event, the user will perceive a need. The perceived need will lead the user to search for information, making demands upon a variety of information sources. These information sources include information systems, such as, university libraries and public libraries; human resources, such as, scientists, researchers, and friends; and other resources, such as, personal collections and media. Information seeking behavior may lead to either a success or a failure. If successful, information is located which will be used. This may result in the satisfaction or nonsatisifcation of the original perceived need. Satisfaction occurs when the located information has been processed and satisfies the original perceived need. Nonsatisfaction occurs when the information does not satisfy the original perceived need. With nonsatisfaction, the information seeking process may be repeated until satisfaction occurs. A failure to find information may result in the process of information seeking being continued. Krikelas (1983) stated that "information seeking begins when someone perceives that the current state of knowledge is less than that needed to deal with some issue (or problem). The process ends when that perception no longer exists" (p. 7). That is, the information seeking process ends when the perceived need has been satisfied.

FIGURE 1
INFORMATION SEEKING BEHAVIOR MODEL


USER
EVENT/ENVIRONMENT
SATISFACTION/ NONSATISFACTION
NEED
INFORMATION SEEKING
INFORMATION USE
INFORMATION SOURCES
DEMANDS UPON INFORMATION SYSTEMS
DEMANDS UPON OTHER RESOURCES
DEMANDS UPON HUMAN RESOURCES
SUCCESS IN LOCATING INFORMATION
FAILURE TO LOCATE INFORMATION

Adapted from Wilson, 1981, p. 4 and Krikelas, 1983, p. 17

C. INFORMATION SOURCES

Inherent in information seeking is the concept of information sources. Two factors related to the use of information sources have received attention: the use of formal versus informal sources, and the reasons why certain information sources are chosen.

Generally, formal information sources are the types of materials that are found in libraries, such as books, periodicals, indexes, and abstracts while informal information sources are comprised of conversations with colleagues, friends, relatives, and personal communications. Ford (1973) postulated that formal sources of information are readily available for use by many people at different times. Informal sources, however, operate on an individual, interpersonal basis.

1) General Studies

In contrast to library use, few studies have been conducted on the information seeking behavior of the general public. One of the first such studies was conducted by Parker and Paisley between 1964 and 1966. The researchers interviewed 1869 adults in two California communities to find out "what kinds of people seek what kinds of information through what channels" (1966, p. I/1). Specifically, respondents were asked about their use of adult education, mass media (for example books and libraries) and interpersonal information sources. It was discovered that, while men were more inclined to use interpersonal sources for business and financial information, women used such sources for health and welfare information. In addition, it was found that both men and women sought their business-related information more frequently from experts than from friends. Friends were an important interpersonal source of information when the need related directly to the home or entertainment.

The researchers cross-tabulated the responses by subject age, sex, education, occupation, income, and length of residency in the community. The results indicated that the sources most commonly associated with information (for example, newspapers and magazines, non-fiction and reference books, and libraries) were more frequently used by adults who had some exposure to college than by adults whose formal education was high school or less. Education was the strongest predictor of use of mass media for obtaining information. In summary, then, the results demonstrated that informal sources were an important source of information for the general public.

Other researchers (Warner & Murray, 1973; Palmour, 1979; Chen & Hernon, 1982) have investigated the general public's information seeking behaviors and have arrived at the same conclusions as Parker and Paisley (1966): personal, informal information sources are used with greater frequency than either media or institutional (for example libraries) information sources. Because of these findings the present study included sources of informal information among those chosen by undergraduate students in relation to their coursework.

2) Scientists and Researchers

Allen (1966) maintained that

> information processing is now and always has been the basis of scientific activity. As physical systems consume and transform energy, so does the system of science consume, transform, produce and exchange information (p. 1-1).

Researchers, therefore, have been interested in describing the flow of information in a scientific environment. One of the first researchers, Herner (1954), interviewed workers in pure and applied science in order to determine their information seeking habits. Herner discovered that the workers derived a median of 60 percent of their information from scientific literature. The scientists did use verbal sources of information, but not to as a great extent as scientific literature.

Allen (1966) conducted an indepth analysis of the flow of technical information among engineers. The subjects were engaged in research projects, and based their responses on their information activities related to the projects. Data were gathered through several methods: time allocation forms which were submitted by participating engineers; periodic progress reports; "solution development records" which provided a weekly estimate of the probability of adoption of a possible solution to a technical problem; and post-project interviews.

Allen drew a distinction between information in science and in technology.

> Information in science retains its verbal form throughout the process; as a result it is readily contained and stored in a written form. In the case of technology, information is used to direct and mold the energic inputs which become the final product. And excepting the extent to which transformed information is produced as a by-product, it loses its form and becomes coded in the structure of physical output (p. 1-1, 1-2).

Allen argued that it was necessary to distinguish between two kinds of information because of his discovery that there were differences between the information seeking behaviors in science and technology. Scientists were found to rely more heavily upon written sources than oral sources of information, while for technologists the pattern was reversed. Allen concluded that formal sources and informal sources are important to both scientists and technologists, but to varying degrees.

Allen identified three methods of information gathering common to science and technology:

1) literature searching,
2) consultation with technical staff, and
3) consultation with sources external to the organization.

The first method refers to formal sources of information; the other two methods refer to informal sources of information. Allen found that the proportion of time spent on information gathering varied significantly over the duration of projects in both science and technology. Information gathering was at its maximum during the initial portion of a project, tapering off during a second phase, but then rising again during a third phase. This cycle was true for both science and technology.

These findings have important implications for interpreting the results of user surveys. For example, if a large proportion of the respondents in a particular study were in the initial phase of their projects, information gathering would be overreported. Project phase must therefore be taken into account in conducting user studies.

Allen's study is important for highlighting the difference between the two modes of investigation in science and technology, and for his discovery that a corresponding difference exists in information seeking behaviors.

Other studies (Menzel, 1958; Paisley, 1966; Rosenbloom & Wolek, 1970; Brittain, 1970; Lipetz, 1970; Friedlander, 1973; Quaglieri, 1982) support Allen's (1966) claim that both formal and informal information sources are important to researchers in science and technology.

More recently, Salasin and Cedar (1985) undertook a survey of applied researchers, policymakers, and practitioners in the field of mental health services. They investigated the following aspects of information seeking behavior:

1) respondent demographic characteristics,
2) respondent use of various information sources
3) relative importance of these sources, and
4) personal contacts outside the respondents' organization (p. 94).

They discovered that the respondents rarely sought information from outside their organization. Indeed, 80 percent of their information seeking activity involved intraorganizational person-to-person communication. Differences were observed in the sources of information used by individuals in different work roles and settings. Their survey findings were consistent with previous studies.

In light of these studies of the flow of information among practictioners of science and technology, the present study focussed on students in one area of science and technology, agriculture and forestry, in order to determine whether their information seeking behaviors were consistent with those of the professional researchers.

3) Students

Few studies have focussed on the student as an information seeker. Most research has concentrated on library use by undergraduate and graduate students in an academic environment. Generally, it has been found that proportionately few students use the university or college library. If students do not use the academic institution's library, the question is raised of how and where they find the information which they need in order to satisfy their academic studies.

Recently, librarians and researchers have begun to address this issue. Whitlatch (1983) discovered that more than half of the 1,470 surveyed undergraduate students at San Jose State University used community libraries in connection with their coursework. She did not investigate the reasons why students used an information source other than the university library, nor did she attempt to identify other possible available information sources.

Day and McDowell (1985) investigated the information use and needs of 25 art and design students in Great Britian. Students were interviewed to ascertain how they found the information they needed, and what part, if any, the library played in their search for information. They discovered that published information was not necessarily the most important source to students. The authors noted that, given the nature of student work and course requirements, the approach to information "could involve visiting shops to look at products or designs currently available, writing to manufacturers, observations or doing their own markert research" (p. 34). In addition, the researchers described the amount (such as frequency of visits and number of items borrowed) and type (such as browsing and literature reviews, current awareness) of library use by the students. The fact that other sources of information were available was recognized by the researchers, but the study's core issue was library use.

Dunn (1984) appears to be the only researcher who has concentrated solely on the nature of the information sources chosen by students, rather than on students' use of the library. She surveyed 566 undergraduate students in all years at Loma Linda University in California, concentrating on their information seeking behaviors. Loma Linda University is an educational institution which emphasizes spiritual and religious values as well as academic achievement. At the time of Dunn's study, it had an enrollment of 1,700 undergraduate students.

Dunn's research included investigation of the psychological needs that motivated a student to search for information, as well as the different sources of information that the student chose. Her methodology included both unstructured and structured interviews. From the interviews, Dunn identified the following formal sources of information that were used by the students: college and university libraries, departmental libraries, public libraries, and special purpose libraries. The following informal sources were identified: teachers, experts in the field, classmates, husband or wife, and friends. In total, sixteen sources of information sources were reported by the students.

Based on the interviews, Dunn constructed a questionnaire that was distributed to undergraduate students during class periods. The subjects of the study included only those students who went beyond course requirements when seeking information. Results showed that students ranked teacher as the most important source in satisfying information needs, followed by library, expert in the field, and personal library. Dunn concluded that authoritative, informal sources are often chosen first, followed by authoritative, formal sources (p. 141).

Limitations are evident in Dunn's research. Although she attempted to determine whether there was a relationship between information source chosen and motivating psychological need, she did not directly ask the respondents why they deemed an information source to be important. This question would seem to be a crucial part of the knowledge which is needed about information seeking behavior, and it was accordingly one of the primary aspects addressed in the present study.

4) Factors Influencing Choice of Information Source

Given the wealth of information sources available, what makes a person choose one source over another? It has been hypothesized that certain factors will affect the choice of an information source. In the 1950's, Menzel (1958) conducted a study of information exchange among biochemists, chemists and zoologists. He discovered that these scientists frequently used interpersonal, informal sources for obtaining information related to their research. Menzel concluded that the selection of an information source is dependent upon the anticipated utility and anticipated cost of the information required.

Ford (1973) suggested that two factors which influence the choice of information source are accessiblity and perceived quality of the sources. He found that the concept of accessiblity encompassed costs, distance to be travelled, and availability. Other researchers have also concluded that accessibility, availability, and ease of use are the determining factors in choosing an information source (Rosenberg, 1967; Allen, 1977; Friedlander, 1973).

From the literature, Hardy (1982) identified two models of source selection in information:

1) the "cost/benefit model" in which the information seeker is concerned with the expected benefits and costs of using an information channel and chooses an information source on that basis, and
2) the "least-effort model" in which the individual selects the information source that requires the least amount of expended effort, both psychologically and financially.

Hardy investigated, by means of a questionnaire, the sources of information used by Forest Service Practitioners in the United States and their reasons for using those sources. Based on preliminary field interviews, he identified five factors that are used by these practitioners to evaluate information source preference.

1) ease of use - how easily the source can be used to access the information needed,

2) time-saving ability - how much time a source can save by providing the needed information,
3) relevance - how much useful information is provided by the source,
4) selectivity - how precise the source is in weeding out exactly what information is wanted, and
5) promptness - how much time it takes to deliver the information (p. 291).

Questionnaire responses were subjected to factor analysis in order to determine whether the factors were independent. It was discovered that factors one, two, and five correlated highly, and factors three and four correlated highly. Hardy labelled the two derived factors 'speed' and 'content'. Regression analysis of the two derived factors revealed that 'speed' was given much greater weight by the practitioners in choosing between information sources. Hardy concluded that "ease of accessing information has greater importance to information seekers than the amount of quality of information available" (p. 292). However, content was still an important consideration. Hardy noted that the quality of information must be maintained at the same time that its accessibility is improved.

Other factors, particularly psychological ones, may also play a role in determining an individual's choice of information source. Dunn (1984), as noted above, argued that beyond the pragmatic considerations of accessibility and ease of use, there were psychological factors which influence an individual's selection of one source of information over another. Consequently, both of these factors, the pragmatic and the psychological, were investigated in the present study within the context of information seeking by undergraduate students.

D. PSYCHOLOGICAL ASPECTS OF INFORMATION SEEKING

Although it is clear that individuals actively seek information, it is not immediately obvious why and when they are motivated to do so. Few researchers in library and information science have investigated the motivational aspects of information seeking behavior; however, this topic has received considerable attention in the area of psychology. For the most part, these studies have concentrated on the psychological variables of approach and avoidance tendencies and generalized drives.

Feather (1967) maintained that information seeking behavior is a result of approach and avoidance tendencies. He argued that people seek out information which is consistent with their previous beliefs and views, and avoid information which challenges their opinions. Therefore, people tend to pursue consistency and to avoid inconsistency.

Studies of generalized drive in human beings have concentrated on the need for control. Rotter (1966) developed the internal versus external control of reinforcement scale (I-E). It refers to the extent to which people feel that they have control over the reinforcements which occur relative to their behavior. Internal individuals believe that they control their own destiny and reinforcements while external individuals feel they do not have such control. This was termed "locus of control" (Rotter, 1966). Based on Rotter's model, DeVito, Bogdanowicz and Reznikoff (1982) investigated the health-related information seeking of students and "health locus of control". The researchers discovered that individuals with an internal health locus of control orientation and a high health concern expressed a desire to obtain a greater mean number of health-related pamphlets than did people with an external orientation or a low health concern.

Other researchers have considered the psychological apsects of why people seek information in a different light. Parker and Paisley (1966), mentioned previously, conducted a study of the information seeking patterns of the general public. In addition to researching the types of information sources consulted, two psychological variables were studied: "achievement motivation" and "need for affiliation". They attempted to determine the relationship between these psychological factors and the extent and kind of information seeking activity exhibited by the public.

"Achievement motivation" was defined by Parker and Paisley as the need to accomplish or master something difficult. They described people with a high need for affiliation as those who desire to do things in the company of others. The researchers examined the behavior of achievement-oriented individuals in the context of mass media usage and participation in adult education programs. It was discovered that the achievement-oriented individuals were high users of the print media. High achievement-oriented people generally used media for social contact or relaxation but used books specifically for finding information more frequently than did low achievement-oriented people. In the area of adult education, the results indicated that achievement-oriented people had a higher rate of participation and used adult education for vocational purposes.

The researchers found that a high level of education was necessary in order for a positive relationship to exist between the need for affiliation and information seeking through interpersonal sources. They concluded that achievement motivation and need for affiliation are determining factors in some peoples' quest for information.

Other researchers (Zweizig, 1973; O'Connor, 1978; Boone, 1980) have also suggested that motivational needs and variables play an important role in information seeking behavior. Most recently, Dunn (1984) has addressed this issue.

Dunn (1984), referred to earlier in the subsection on student information seeking, conducted a study to determine which psychological needs influence undergraduate students to seek information beyond course requirements. Rather than concentrating on such concepts as approach and avoidance tendencies, locus of control, or achievement and affiliation, her theoretical foundation was based on need theory as described by the psychologists Lewin, Murray, Alderfer, and Maslow. "Need theory" is concerned with the subjective experiences of people as they interact with a complex environment (Alderfer, 1972).

Lewin (1938) provided only a generalized view of psychological needs, while Murray (1938) suggested a taxonomy of needs. Maslow (1954), however, developed a hierarchy of needs divided into five categories: physiological needs, safety needs, love and belongingness needs, esteem needs, and needs for self-actualization. He contended that all needs are inate and are ordered according to prepotency, or influence, with physiological needs being the most prepotent.

Alderfer (1972) developed an "ERG theory" of needs based on Maslow's hierarchy. Alderfer collapsed the five categories into three: existence (E), relatedness (R), and growth (G). He theorized that existence needs include physiological and material desires, while relatedness needs deal with interpersonal relationships, and growth needs are comprised of factors that influence one to produce a creative or productive effect on oneself and on the environment. Dunn (1984) postulated that the psychological needs which influence undergraduate students to seek information would fall into the Maslow/Alderfer categories.

Dunn identified 61 psychological needs, based on two sets of interviews with students. The psychological needs focussed on "family, friends, teachers and classmates, boyfriends or girlfriends, personal goals, and professional aspirations" (p. 70). Responses from her survey questionnaire were subjected to factor analysis, which resulted in six hypothetical "need factors":

Factor 1: Need for other approval,
Factor 2: Need for success in chosen profession,
Factor 3: Need for self-extension,
Factor 4: Need for self-approval,
Factor 5: Need for intellectual stimulation, and
Factor 6: Needs related to a successful college experience (p. 95).

The psychological need variables which correlated highest with each of the six need factors were included in that factor. It must be noted that not all need variables were included in the factor loadings. (See Table 1 for a summary of the factor analysis of the six need factors.)

The results indicated that the need for intellectual stimulation, factor 5, was the most influential in undergraduate students' search for information followed by followed by the need for self-approval, factor 4. The next most influential was the need for success in one's chosen profession, factor 2, the need for self-extension, factor 3, followed by the needs related to a successful college experience, factor 6, and the need for other approval, factor 1 (p. 95). Dunn maintained that students pursued an interest or problem encountered in class because they seek approval, knowledge, success, mental and spiritual challenge (p. 121). In addition, Dunn also maintained that these need factors related to and supported previous research in psychology, particularly that of Maslow's (1954) and Alderfer's (1972). As a result of Dunn's study, there is a basis for suggesting that information seeking is, in part, motivated by basic psychological needs. The present study explored this issue further.

TABLE 1
SUMMARY OF DUNN'S (1984) NEED FACTORS

FACTOR	VARIABLES
1: Need for Other Approval	- Need to have classmates think I'm smart - Need to have teacher think I'm smart - Need to compete with classmates for teacher's approval - Need to do more than is required for the class so that I can feel equal to my classmates - Need to have friends think I'm smart - Need to have teacher notice me - Need to prove myself to my husband/wife or boyfriend/girlfriend
2: Need for Success in Chosen Profession	- Need to be well prepared for chosen profession - Need to be successful in chosen profession - Need to have broader understanding of the subjects that relate to my chosen profession - Desire for more information about my chosen profession - Need to meet requirements for employment in my chosen profession - Need to know wide variety of things so I can feel secure in terms of job market - Desire to compete better in job market
3: Need for Self-Extension	- Need to learn more about God - Need to know more so that when I have children I can do a better job of raising them - Desire to have a broader outlook toward life and people - Need to know more in order to help others - Need to become a whole person in terms of the mental, physical, and spiritual - Need to understand different people and their environments
4: Need for Self-Approval	- Desire to know and understand in order to feel better about myself - Need to avoid feeling frustrated by lack of knowledge - Need to live up to my expectations of myself - Need to feel intelligent - A feeling of insecurity when I think I should know something but I don't

5: Need for Intellectual Stimulation	- Enjoyment of learning for its own sake - Personal interest in subject of class - Inner drive to learn more about the subjects that make me curious - Need for the excitement and fun of finding answers - Personal satisfaction
6: Needs Related to a Successful College Experience	- Need to get my money's worth out of college - Need to get good grades - Need to feel that my parent's money is well spent on my college education - Need to get everything I can out of my college education - Need to know in order to do better in upcoming classes - Need to understand basic content of course

CHAPTER III

RESEARCH DESIGN

Two methods were used to gather data to answer the research questions and to test the study hypotheses posed in Chapter I. These data gathering methods were: a questionnaire survey, and critical incident interviews. Together, these methods produced a combination of both quantitative and qualitative information.

A. STUDY POPULATION

The subjects for this study were first-year and fourth-year undergraduate students registered in the Faculty of Agriculture and Forestry at the University of Alberta.

The Faculty of Agriculture and Forestry offers courses leading to four-year professional Bachelor of Science degrees. The areas of study include: Agriculture, Food Science, Forestry, Agricultural Business Management, Agricultural Engineering, and pre-Veterinary Medicine. The B.Sc. Agriculture program offers eleven specializations and a general route of study. The specializations include: agricultural economics, agronomy, animal science, dairy science, entomology, grazing managment, plant protection, plant science, poultry science, and soil science. Students also take courses from other faculties and departments in the University. In the Province of Alberta, the second, third, and fourth years of programs in Agriculture and Forestry are offered only at the University of Alberta; however a modified first-year program may be taken at the University of Calgary, at the University of Lethbridge, or at one of the affiliated Junior Colleges, such as Red Deer College or Grande

Prairie Regional College. The Faculty also offers a two-year pre-Veterinary Medicine program which may allow entrance to the four-year program in Veterinary Medicine at the Western College of Veterinary Medicine at the University of Saskatchewan in Saskatoon.

During the 1987-88 academic year, 751 undergraduate students were registered in the Faculty. A breakdown of the enrollment is found in Table 2.

Students registered in Forestry or any of the Agriculture specializations comprised the sample for the present study. In addition, students registered in the two-year Pre-Veterinary program were included in the study, as many of these students will complete a four-year Agriculture or Forestry degree if they are not admitted to a veterinary program. Students with majors in Food Science, Agricultural Business Management, and Agricultural Engineering were not included in the study. These programs have small enrollments and many of their courses are offered jointly with the Faculty of Home Economics, the Faculty of Business, and the Faculty of Engineering respectively. Students classified as special students were also excluded from the study.

Other studies have suggested that the greatest difference in library use is found between first-year (freshman) students and fourth-year (senior) students (Lane, 1966; Lubans, 1971). Accordingly, this study assumed that first-year and fourth-year students would demonstrate the greatest differences in both their information seeking behaviors and psychological motivations.

TABLE 2
UNDERGRADUATE ENROLLMENT BY PROGRAM,
1987-1988

PROGRAM	YEAR OF PROGRAM				
	First	Second	Third	Fourth	Total
*Agriculture	73	71	108	114	366
*Forestry	29	44	45	32	150
*Pre-Veterinary Science	39	39	-	-	78
Agricultural Engineering	13	13	5	13	44
Agricultural Business	-	-	-	5	5
Food Science	7	13	17	22	59
Special Students	-	-	-	49	49
Total	161	180	175	235	751

*Students in these programs only comprise the study's sample
Student enrollment figures for 1987-1988 provided by
the Assistant to the Dean of Agriculture and Forestry

B. QUESTIONNAIRE DEVELOPMENT

The questionnaire method of data gathering allows the researcher to survey a large sample of subjects in a relatively short period of time and to provide information regarding attitudes, beliefs, and behaviors (Kunz, 1977; Busha and Harter, 1980). Accordingly a questionnaire was used as the main survey instrument in the present study.

Based on previous studies and questionnaires, especially Dunn's (1984), and on consultations with the Area Coordinator and a science librarian at the Science and Technology Library at the University of Alberta, the questionnaire was developed according to four main sections:

1) course requirements and information sources,
2) psychological needs,
3) information problems and previous bibliographic instruction, and
4) demographic information.

Both structured and open-ended questions were included. Structured questions were designed to obtain quantitative data on the information seeking behaviors and the motivating needs of the students. Open-ended questions were designed to solicit qualitative data on why the respondents deemed certain information sources to be important, what problems they encountered during their search for information, and their evaluation of previous bibliographic instruction courses.

Two versions of the questionnaire were developed, one for the first-year students and one for the fourth-year students. (See Appendices A and B.) The two questionnaires only differed on one question. The first-year questionnaire excluded the question which asked where the respondents had taken their first year of Agriculture and Forestry.

A synopsis of the questionnaire follows.

Section 1: Course Requirements and Information Sources

The questions in this section related to:

1) Course Requirements - Students were asked to identify the course requirements for which they sought information during the previous semester, selecting from a list of eight pre-identified possibilities: assignments, labs, term papers, exams, seminars, beyond class requirements, other, and none.

2) Information Sources - Students were asked to indicate how important each information source was for each of the eight pre-identified course requirements, using a Likert-type rating scale. The list of information sources was based on Dunn's (1984) list, and revised on the basis of interviews during the pretesting of the questionnaire with graduate students specializing in Agriculture or Forestry. Students were also asked to identify the three most important information sources and the reasons why they considered these sources important.

Section 2: Psychological Needs

The questions in this section related to:

1) Psychological Needs - Students were asked to rate the extent to which certain psychological needs influenced them to search for information. Again, a Likert-type rating scale of influence was employed. Although these psychological needs were based on Dunn's (1984) list, the list developed for the present study was reduced from her 61 needs to 23 needs as identified through rigorous logical and conceptual analysis. (For a complete listing and

analysis of Dunn's need statements see Appendix C.) Some of Dunn's need statements were repetitious, so they were collapsed into a single statement. For example, three of Dunn's statements,

> "Need to have my friends think I'm smart",
>
> "Need to have the teacher think I'm smart",
>
> "Need to have classmates think I'm smart",

were grouped in the present study into one concept:

> "Need to have others think I'm smart".

Other need statements identified by Dunn were not conceptually distinct, so they were combined into mutually exclusive categories. For example, Dunn's statements,

> "Need to meet requirements for employment in chosen profession",
>
> "Need to be well prepared for chosen profession",
>
> "Need to know a wide variety of things so that I can feel secure in terms of the job market", and
>
> "A desire to compete better in the job market"

were reduced in the present study to one concept:

> "Need to compete better in the job market".

In addition, some of Dunn's need statements were in fact the means to achieving a need, not a need per se. Means and ends were conflated in such cases. For example, Dunn's statement,

> "Need to do more than is required for the class so that I can feel equal to my classmates",

consists of two separate concepts:

1) the need to feel equal to classmates, and
2) the means of achieving this need, that is, doing more than is required for the class.

This need statement was therefore reconceptualized in the present study as:

"Need to feel equal to others".

Section 3: Information Problems and Previous Bibliographic Instruction

The questions in this section related to:-

1) Information Problems - Students were asked if they had encountered any problems in finding and getting the information that they required.

2) Bibliographic Instruction - Students were asked if they had taken any courses, seminars, or lectures on how to find information, and whether these courses had been effective. The term "library instruction" was not used as it was desired that the students focus their responses on information seeking in general, not on library use in particular.

Section 4: Demographic Information

This section related to:

1) Demographic Data - This section asked for student characteristics such a[illegible]x, class status, and major area of study. Fourth-year students were asked at which institution they had completed their first year of Agriculture and Forestry. In addition, students were asked to indicate whether they had taken AGFOR 201, Introduction to Agriculture, and/or AGFOR 204, Practice in Communication. These are recommended courses and contain a bibliographic instruction component.

At the end of this section, students were asked if they would be willing to participate in a short follow-up interview. This was the method used for identifying volunteer subjects for the interview phase of the study.

A covering letter indicating the purpose of the study and the instructions that should be followed was attached to the front of the questionnaire. (See Appendix D.)

The draft questionnaire was pretested on 11 graduate students specializing in Agriculture or Forestry. In personal interviews with the pretest participants, each student was asked a standardized set of questions. (See Appendix E.) The students seemed to have difficulty following the original format and the wording of question 3, which referred to information sources used; therefore modifications were made. They also indicated that "seminars" should be added to the list of course requirements. With regard to the list of information sources, they suggested that "teaching assistant" should be included. The rest of the questionnaire did not pose any problems. The revised questionnaire was pretested on graduate students specializing in Library Science.

The final version of the questionnaire was reviewed and approved by the thesis supervisor and the internal member of the thesis committee. In addition, the questionnaire was given to the Dean of Agriculture and Forestry for his permission to distribute it to students in that Faculty.

C. QUESTIONNAIRE DISTRIBUTION

Several methods were used to distribute the questionnaires. These included: distribution in selected classes, distribution through the Students' Records Office of the Faculty of Agriculture and Forestry, and mail distribution.

The first method, distribution of the questionnaire in selected classes, took place from February 4 to February 12, 1988. Typically, mailed questionnaires do not have a high rate of response; therefore it was anticipated that a higher response rate would be achieved by distributing the questionnaire during class periods. The professor of each targeted course was contacted in advance to obtain permission to distribute the questionnaire during class time, and also to arrange a date for the distribution. All professors agreed to the proposed distribution procedure.

Various courses were selected in consultation with the Assistant to the Dean of Agriculture and Forestry. Courses were chosen on the basis of the largest enrollment of first-year and fourth-year students, but excluded courses concentrating on Food Science, Agricultural Business Management, and Agricultural Engineering. The selected courses included: AGFOR 204, Practice in Communication; FOR 210, Wildland Resources Measurements; AGFOR 451, Practical and Professional Agriculture; SOILS 460, Soils Fertility; INTERD 432, Forest Administration and Policy; and INTERD 486, Livestock and Meat Marketing.

Initially, the questionnaires were distributed at the beginning of each class period by the researcher. The first class in which the questionnaire was distributed took almost twenty minutes to complete. It was therefore decided that it would be less disruptive to the class to have the students hand in the completed questionnaires to the researcher at the end of the period, rather than at the point of immediate completion. The standardized verbal instructions produced by the researcher asked that the respondents base their answers on the previous semester, and to fill out only one questionnaire. At the same time, confidentiality of responses was assured. Furthermore, if a student had not attended university during the previous semester, he or she was requested not to participate in the study.

Because the response rate for first-year students was relatively low it was decided to increase the proportion of respondents by placing a large sign in the

Students' Records Office in the Agriculture and Forestry Building, and asking first-year students to pick up a questionnaire package. The package consisted of the student's name on the envelope, a revised covering letter, and the first-year questionnaire. (See Appendix F.) Students who had already completed the survey instrument in class were asked to indicate this on their package. However, only four completed questionnaires were obtained in this manner.

As it was impossible to ascertain which first-year students had completed the survey instrument during the class distribution phase, questionnaires were then mailed to all those not registered in AGFOR 204. Fifty-four questionnaires were mailed out and respondents were asked to bring the completed form to the Students' Records Office in the Agriculture and Forestry Building by March 2, 1988. (See Appendix G.)

Only five completed questionnaires were returned; however two of them were from students registered in Agricultural Engineering so they were not included in the analysis. In addition, three other questionnaires were returned indicating that these persons no longer lived at the addresses used. Therefore, only three usable questionnaires were obtained through the mail-out method.

D. INTERVIEWS

Wilson (1981) has suggested that qualitative research is an appropriate methodological approach to the study of information seeking behavior for the following reasons:

1) the researcher is concerned with uncovering the facts of the everyday life of the respondents,
2) by uncovering the facts, the researcher strives to understand the needs that motivate the individual to seek information,

3) by understanding the underlying needs, the role of information in everyday life may be understood, and
4) by having a better understanding of the user, the researcher should be able to design more effective information systems (p. 11).

Critical incident studies focus the respondent's attention on a specific incident or case from the recent past, and attempt to obtain a step-by-step record of behaviors for that event (Kunz, 1977; Flanagan, 1954). During the questionnaire phase of the present study, subjects were asked if they would be willing to participate in an interview at a later date. The students who indicated their willingness were then interviewed by telephone, using the critical incident technique described above. The qualitative data obtained from the interviews contributed to a more detailed and accurate description of the information seeking process of undergraduate students in the Faculty of Agriculture and Forestry.

The interview schedule was structured but allowed for unstructured and spontaneous responses to each question. (See Appendix H.) The respondent's questionnaire was used in conjunction with the interview, in order to verify for which course requirement the student had spent the most time trying to find information during the previous term.

The major sections of the interview schedule addressed:

1) Course Requirement - Students were asked if they remembered the course requirement they specified on the questionnaire, and to provide more details about it; for example, what class it was for, what did it consist of, format, and percentage of final grade. If they were not able to remember this course requirement, they were asked to focus on a course requirement from the

present term where they spent the greatest amount of time searching for information.

2) Information Seeking Steps - Students were asked to recount the steps they followed in order to find the required information. At times, based on the information sources listed on the questionnaire, probing statements were used because the students were not able to recall their information search process in its entirety. Subjects were also asked why they chose a certain information source and if they thought that they were able to get all the information needed in order to adequately complete the course requirement. Another question focused on the efficiency of the approach that students followed in trying to find information.

3) University of Alberta Library System - Students who indicated during the interview that they had used any of the university libraries, were asked what would be the most important change the university library system could implement in order to assist them in finding information more efficiently. If respondents indicated that they had not used any of the university libraries, they were asked reasons for not using them.

Eleven first-year students and 11 fourth-year students indicated that they would participate in interviews. All 22 respondents were telephoned, and the interview was conducted immediately by telephone, or a more convenient time was arranged if necessary.

Several attempts were made to reach all the prospective interviewees, but the researcher was not able to contact 2 students even after repeated telephone calls. One student set up an appointment time, but did not keep it. In total, then, 9 first-year students and 10 fourth-year students were interviewed. Interviews ranged from 7 minutes to 12 minutes, depending on how much information the subject was able to recall. The interviews were conducted between April 11 and April 18, 1988.

E. METHODS OF DATA ANALYSIS

A coding system was developed for data entry of questionnaire responses. Each questionnaire was assigned a unique three digit identification number and the coded responses to each question were entered into a computer line file. In order to analyze the data, three methods of data analysis were used: descriptive statistics, statistical testing of the null hypotheses, and manual analysis of the open-ended questions and critical incident interviews.

Descriptive statistics included frequencies and percentages for the variables first-year and fourth-year students, course requirements, information sources, psychological needs, and bibliographic instruction.

A number of statistical tests were employed in order to test the null hypotheses. T-tests were used to examine the differences between

1) the information sources chosen by first-year students and those chosen by fourth-year students,

2) the motivating psychological needs of first-year students and those of fourth-year students,

3) the information sources chosen by students who had been exposed to bibliographic instruction and students who had not been exposed to bibliographic instruction. Separate t-tests were conducted on several variables in order to examine these differences. The relevant questions from the questionnaire include whether the students had taken a bibliographic course, whether the students had taken AGFOR 201 and/or 204. And

4) the information sources chosen by fourth-year students and their academic institution of first-year attendance.

One-way analysis of variance was used to examine the relationship between course requirements and information sources chosen. This analysis was based on the aggregated multiple responses for each of these two variables. Responses of "did not use", "not important", and no response were grouped together and coded as "not important". In addition, responses of "none" and "other" were excluded. An F-test was also conducted with the one-way analysis of variance in order to determine which information sources had significant differences among their observed means of importance. These information sources would be significantly related to the type of course requirement.

As the sample sizes for each type of course requirement were not equal, the Scheffé method was used to make pairwise comparisons of the significantly related groups of course requirements for each information source. Each course requirement was compared with the other course requirements for each of the information sources chosen by the respondents.

A Pearson's Product Moment Correlation Coefficient test was conducted to determine whether a relationship existed between information sources chosen and influencing psychological needs. The test was conducted individually for each of the six identified course requirements.

Open-ended questions were analyzed manually by copying the responses verbatim from the questionnaire, and analyzing these transcripts for general patterns and trends as well as for unique responses. The information received from the telephone interviews were treated in the same manner.

CHAPTER IV

DATA ANALYSIS

This chapter presents the responses from the student questionnaires and the results of the critical-incident telephone interviews with selected students. Results are discussed in light of the research questions and research hypotheses posed by the study.

The first part of the chapter presents the quantitative data obtained from respondents by means of the questionnaire. Descriptive statistics about course requirements, information sources, and psychological needs are discussed. Statistics reporting means, standard deviations, comparative percentages, and rankings are presented in tables and graphs. In addition, appropriate statistical tests -- one-way analysis of variance, Scheffé procedure, Pearson product-moment correlation, and t-tests -- are presented in order to test each of the null forms of the research hypotheses. A statement of acceptance or rejection of each null hypothesis is given, followed by a statement of acceptance or rejection of each research hypothesis. The significance of the relationships and differences are explored.

The second section of this chapter analyzes the reponses to the open-ended questions from the questionnaire and the results of the critical incident interviews.

A. RESPONSE RATE

In the present study, it is difficult to determine a meaningful response rate based on the number of questionnaires distributed in the selected classes, because some of the respondents were registered in the second or third year of

Agriculture and Forestry. Hence, their questionnaires, although completed and returned to the investigator, could not be included in the sample. In addition, some students may have been registered in more than one of the selected classes in which the questionnaire was distributed. Because of these problems, an exact total of distributed questionnaires to first-year and fourth-year students only is impossible to calculate. As a result, the response rate for the study was based on the total enrollment of first-year and fourth-year students in Agriculture, Forestry, and the pre-Veterinary program. One hundred and twenty-six usable questionnaires were returned, 57 from first-year students and 69 from fourth-year students. A response rate of 40 percent for first-year students and 47 percent for fourth-year students was calculated, as illustrated in Table 3. The combined response rate for both groups of students was 44 percent.

TABLE 3
RESPONSE RATE TO QUESTIONNAIRE

YEAR OF PROGRAM	QUESTIONNAIRES RETURNED	STUDENT ENROLLMENT	RESPONSE RATE
First	57	141	40 %
Fourth	69	146	47 %
Total	126	287	44 %

B. QUANTITATIVE DATA

Quantitative data findings are presented in four parts: course requirements, information sources, psychological needs, and bibliographic instruction and demographic data.

1) Course Requirements

The first section of the questionnaire asked the students to indicate for which types of course requirements they sought information. Table 4 shows that first-year students most frequently sought information for the course requirement assignments (79 percent of respondents). Table 5 shows fourth-year students most frequently sought information for the course requirement term papers (93 percent). It is interesting to note that 89 percent of fourth-year students sought information for assignments. This is an even greater proportion than for first-year students. It must be noted that only 37 percent of first-year respondents stated that they sought information for term papers.

Of the first-year students, only 42 percent sought information for labs and 5 percent for seminars. This can be compared with the fourth-year subjects, 68 percent of whom sought information for labs and 33 percent for seminars. It is also interesting to note that only 5 of the 126 respondents reported that they did not seek information for any course requirement. These 5 students were in the first year of their program. Figure 2 provides a comparison of the course requirements for which first-year and fourth-year students sought information.

Respondents were also asked to indicate the single course requirement for which they spent the most time trying to find information. Table 6 shows that first-year students spent the most time searching for information for assignments (47 percent), while fourth-year students spent the most time searching for information for term papers (49 percent). Figure 3 provides a comparison of the course requirements for which the respondents spent the most time seeking information.

TABLE 4
COURSE REQUIREMENTS FOR WHICH INFORMATION WAS SOUGHT BY FIRST-YEAR STUDENTS

COURSE REQUIREMENTS		FIRST-YEAR STUDENTS			
		Yes	No	No Response	Total
Assignments	#	45	10	2	57
	%	79	17	4	100 %
Labs	#	24	31	2	57
	%	42	54	4	100 %
Term Papers	#	21	34	2	57
	%	37	59	4	100 %
Exams	#	17	38	2	57
	%	30	66	4	100 %
Seminars	#	3	52	2	57
	%	5	91	4	100 %
Beyond Class	#	5	50	2	57
	%	9	87	4	100 %
Other	#	2	53	2	57
	%	4	92	4	100 %
None	#	5	50	2	57
	%	9	87	4	100 %

TABLE 5
COURSE REQUIREMENTS FOR WHICH INFORMATION WAS SOUGHT BY FOURTH-YEAR STUDENTS

COURSE REQUIREMENTS		FOURTH-YEAR STUDENTS			
		Yes	No	No Response	Total
Assignments	#	61	7	1	69
	%	89	10	1	100 %
Labs	#	47	21	1	69
	%	68	31	1	100 %
Term Papers	#	64	4	1	69
	%	93	6	1	100 %
Exams	#	21	47	1	69
	%	31	68	1	100 %
Seminars	#	23	45	1	69
	%	34	65	1	100 %
Beyond Class	#	13	55	1	69
	%	19	80	1	100 %
Other	#	4	64	1	69
	%	6	93	1	100 %
None	#	0	68	1	69
	%	0	99	1	100 %

FIGURE 2
COMPARISON OF THE COURSE REQUIREMENTS FOR WHICH INFORMATION WAS SOUGHT BY FIRST-YEAR AND FOURTH-YEAR STUDENTS

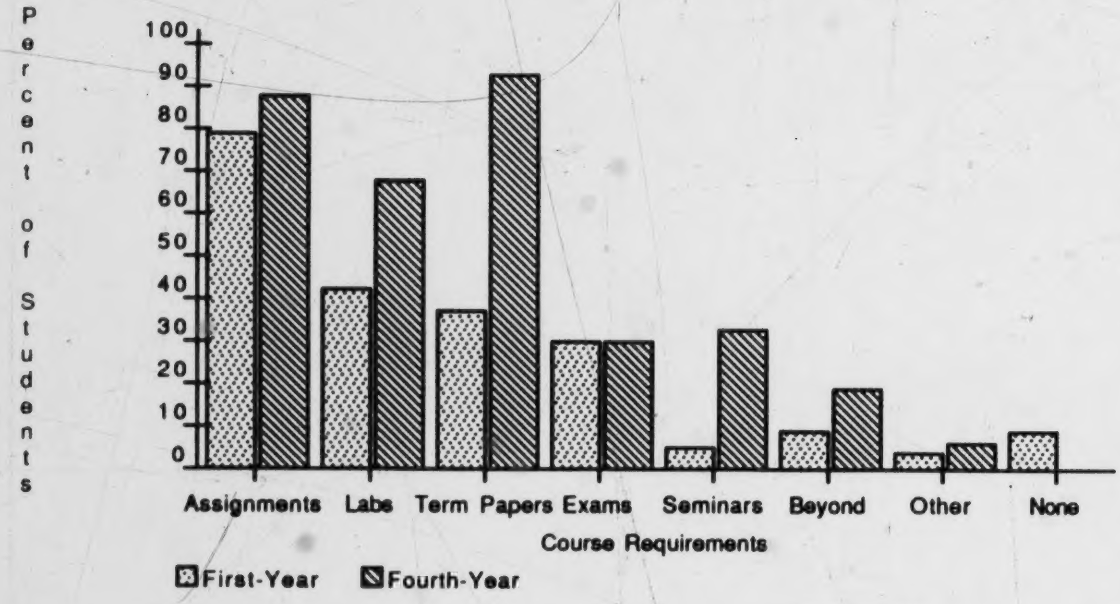
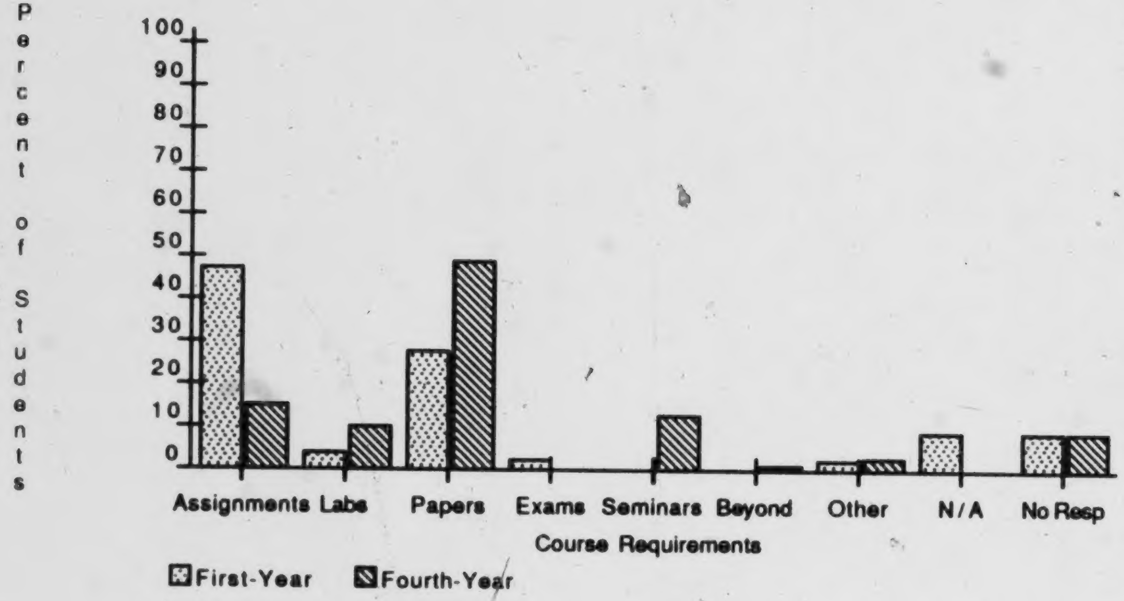


TABLE 6
COURSE REQUIREMENTS FOR WHICH STUDENTS SPENT THE MOST TIME SEEKING INFORMATION

COURSE REQUIREMENTS	FIRST-YEAR STUDENTS		FOURTH-YEAR STUDENTS	
	Number	Percent	Number	Percent
Assignments	27	47 %	10	15 %
Labs	2	3	7	10
Term Papers	16	28	34	49
Exams	1	2	0	0
Seminars	0	0	9	13
Beyond Class	0	0	1	1
Other	1	2	2	3
Not Applicable	5	9	0	0
No Response	5	9	6	9
Total	57	100 %	69	100 %

FIGURE 3
COMPARISON OF THE COURSE REQUIREMENTS FOR WHICH
STUDENTS SPENT THE MOST TIME SEEKING INFORMATION



Discussion

The data suggest that first and fourth year course requirements differ. First-year courses relied most heavily upon assignments, while fourth-year courses were comprised of a variety of course requirements. This is supported by course descriptions from the Faculty of Agriculture and Forestry. As the first-year curriculum depends generally on assignments, it is predictable that first-year students spent the greatest amount of their time seeking information for those assignments. Similarly, since the fourth-year program relies most heavily on term papers, fourth-year students spent the largest amount of their time seeking information for term papers. Typically, term papers rely on printed published material for information, and such information searching is usually time-consuming.

Almost all students reported that they sought information for course requirements. This emphasizes that students normally utilize some kind of information source in order to successfully complete their programs of study. It is also interesting to note that proportionately few students, 9 percent of those in first-year and 19 percent of those in the fourth, sought information beyond course requirements. This result may be compared to Dunn's (1984) study where all participants went beyond course requirements seeking information. Student information seeking in the present study, therefore, appears to be motivated primarily by their academic programs, rather than by other factors.

2) Information Sources

Students were asked to indicate which information sources were important for each type of course requirement. Table 7 gives the total number of responses for each type of course requirement. The numbers on Table 7 represent first-year and fourth-year student responses combined. A total of 355

TABLE 7
TOTAL NUMBER OF RESPONSES FOR EACH COURSE REQUIREMENT

COURSE REQUIREMENTS	RESPONSES PER COURSE REQUIREMENT	
	Number	Percent
Assignments	106	30 %
Labs	71	20
Term Papers	85	24
Exams	38	11
Seminars	26	7
Beyond Class	18	5
Other	6	2
None	5	1
Total	355	100 %

responses for all course requirements was obtained. The greatest number of students sought information for assignments, 106, with the next most frequent course requirement being term papers, 85 respondents, followed by labs, 71 respondents.

As previously mentioned, 5 students indicated that they did not seek information for any course requirement. These 5 students were not included in the analysis of the importance of information sources, therefore a total of 350 combined responses was used in Table 8.

Table 8 illustrates the degree of importance assigned by students to each information source. The data represent the total number of ratings for each information source, regardless of type of course requirement for which information was sought. The responses 'not important' and 'did not use' were grouped together for analysis as it was thought that if a student did not use an information source, it was considered to be unimportant. Sixty-three percent of the respondents indicated that the university library was a very important source of information. An additional 23 percent suggested that it was moderately important. The public library, bookstore, family member, and expert in the field were either considered to be not important, or were not used by the respondents.

Students were also asked to indicate their three most important sources of information for course requirements. Grouped responses are presented in Table 9.

The data show that 22 percent of first-year students and 25 percent of fourth-year students considered the university library to be one of their three most important sources of information. This is consistent with the results that show the university library was ranked very important by students more often than other course requirements. Similarities in the perceived importance of

TABLE 8
IMPORTANCE OF INFORMATION SOURCES CHOSEN BY FIRST-YEAR AND FOURTH-YEAR STUDENTS COMBINED

INFORMATION SOURCE	DEGREE OF IMPORTANCE									
	Very Important		Moderately Important		Not Important/ Did Not Use		No Response		Total	
	#	%	#	%	#	%	#	%	#	%
Public	13	4	29	8	299	85	9	3	350	100
Special	58	16	97	28	188	54	7	2	350	100
Department	86	25	92	26	165	47	7	2	350	100
University	219	63	81	23	50	14	0	0	350	100
Expert	40	11	82	24	220	63	8	2	350	100
Professor	77	22	139	40	131	37	3	1	350	100
TA	54	15	109	31	185	53	2	1	350	100
Family	18	5	44	13	278	79	10	3	350	100
Friend	50	14	126	36	172	49	2	1	350	100
Personal	99	28	129	37	113	32	9	3	350	100
Bookstore	11	3	30	9	288	82	21	6	350	100
Other	7	2	7	2	162	46	174	50	350	100

TABLE 9
GROUPED RESPONSES OF THE THREE MOST IMPORTANT INFORMATION SOURCES CHOSEN BY FIRST-YEAR AND FOURTH-YEAR STUDENTS

INFORMATION SOURCES	FIRST-YEAR STUDENTS		FOURTH-YEAR STUDENTS	
	Number	Percent	Number	Percent
Public	2	1 %	2	1 %
Special	4	2	18	9
Department	1	1	30	14
University	37	22	51	25
Expert	2	1	5	2
Professor	15	9	24	12
TA	9	5	4	2
Family	7	4	2	1
Friend	14	8	12	6
Personal	21	12	21	10
Bookstore	1	1	0	0
Other	3	2	2	1
Not Applicable	15	9	0	0
No Response	40	23	36	17
Total	171	100 %	207	100 %

other information sources for first-year students and fourth-year students are evident: 12 percent of first-year and 10 percent of fourth-year students suggested that their personal library was among the three most important information sources; 9 percent of first-year students and 12 percent of fourth-year students indicated that professor was important; and 8 percent of first-year and 6 percent of fourth-year students rated a friend and classmate among the three most important information sources.

A striking difference between the responses of first-year and fourth-year students to the question of perceived importance of the three most important information sources is found with the special library and the department library. Of the first-year students, only 2 percent considered the special library, and 1 percent considered the department library to be among the three most important information sources. This may be contrasted with 9 percent and 14 percent for fourth-year students, respectively. Figure 4 provides a visual comparison of these data.

i) Hypothesis 1

This research hypothesis predicted a significant relationship between the information sources chosen by students and type of course requirements.

On the basis of the data, the null hypothesis was rejected; therefore, the research hypothesis was supported. (See Table 10.)

In order to determine whether a relationship existed between the information sources chosen by students and type of course requirement, a one-way analysis of variance was conducted. The purpose of analysis of variance is to determine the probability that the means of several groups of scores deviate from one another merely by sampling error. This analysis was based on aggregated multiple responses for each of the two variables, course

FIGURE 4
COMPARISON OF THE MOST IMPORTANT INFORMATION SOURCES
CHOSEN BY FIRST-YEAR AND FOURTH-YEAR STUDENTS

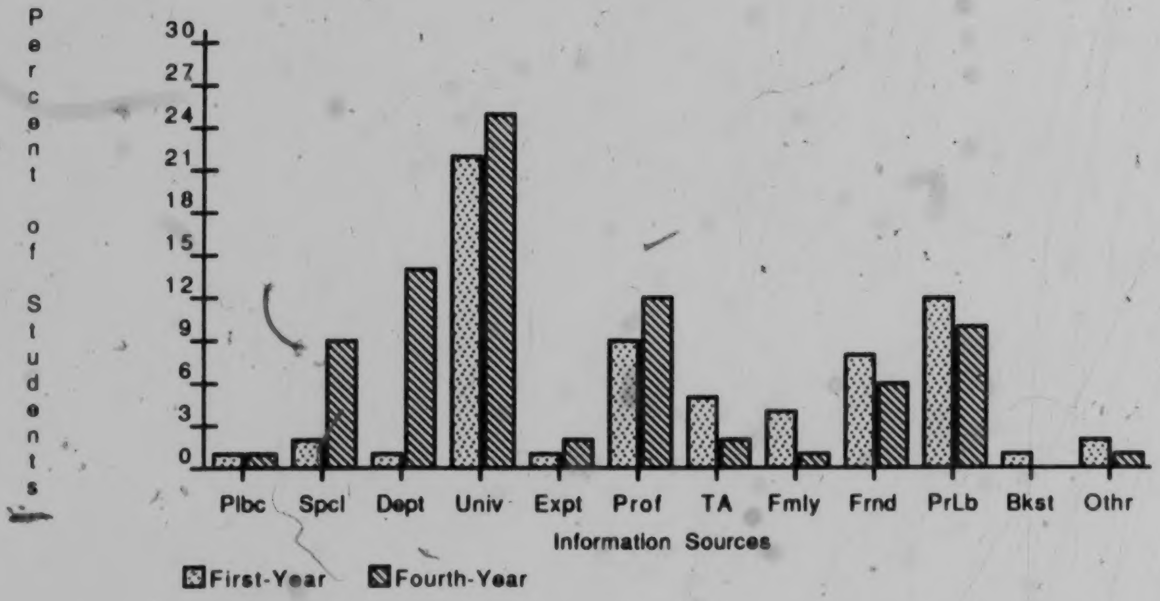


TABLE 10
ANALYSIS OF THE RELATIONSHIP BETWEEN COURSE REQUIREMENTS AND INFORMATION SOURCES CHOSEN BY STUDENTS

INFORMATION SOURCES	MEAN IMPORTANCE OF INFORMATION SOURCES FOR COURSE REQUIREMENTS												PROBABILITY		
	Assignments G1 N=106		Labs G2 N=71		Term Papers G3 N=85		Exams G4 N=38		Seminars G5 N=26		Beyond Class G6 N=18		F-Ratio	P	Scheffé Test Significantly Different Groups*
	$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.			
Public	1.20	.47	1.08	.33	1.16	.51	1.11	.39	1.04	.20	1.39	.70	2.01	.0765	none
Special	1.61	.72	1.34	.58	1.91	.84	1.31	.62	1.58	.81	1.67	.84	5.98	.0000	G3-G4, G3-G2
Department	1.72	.78	1.58	.77	1.94	.88	1.42	.72	1.77	.76	1.83	.92	2.88	.0145	G3-G4
University	2.59	.61	2.30	.78	2.59	.74	1.80	.81	2.53	.81	2.44	.70	8.41	.0000	G1-G4, G3-G4, G5-G4, G6-G4, G2-G4
Expert	1.48	.65	1.37	.64	1.67	.81	1.24	.54	1.23	.51	1.33	.59	3.56	.0038	G3-G4
Professor	1.89	.69	1.77	.81	1.78	.73	1.80	.87	1.69	.68	1.67	.84	0.53	.7539	none
TA	1.50	.67	2.01	.78	1.44	.66	1.53	.76	1.50	.71	1.28	.57	7.23	.0000	G2-G6, G2-G3, G2-G1, G2-G5, G2-G4
Family	1.25	.59	1.14	.42	1.18	.44	1.13	.47	1.04	.20	1.39	.70	1.68	.1383	none
Friend	1.76	.68	1.85	.75	1.48	.65	1.73	.83	1.38	.64	1.56	.70	3.48	.0044	G2-G3
Personal	2.08	.76	1.79	.77	1.84	.80	2.03	.94	1.46	.65	2.06	.64	3.57	.0037	G1-G5
Bookstore	1.11	.35	1.03	.17	1.12	.42	1.21	.58	1.00	.00	1.17	.38	1.86	.1015	none

*P significant at .10

Mean Importance Scale:
1.00 not important
2.00 moderately important
3.00 very important

requirements and information sources chosen. Referring back to Table 7, a total of 355 responses was obtained. The 6 responses of 'other' and 5 respones of 'none' were not included in the one-way analysis of variance. Therefore, the total number of responses for course requirements was 344 for the one-way analysis of variance.

An F-test was conducted with the one-way analysis of variance. As the observed F ratio becomes larger, the probability becomes smaller that an F value of this size would be obtained merely by chance. Table 10 reports the F ratios and the resulting probability. It can be seen that the special libary, department library, university library, expert in the field, teaching assistant, friend and classmate, and personal library had significant differences among their observed means of importance. In other words, these information sources were significantly related to the type of course requirement. The research hypothesis that a relationship existed between the information sources chosen by students and type of course requirement is supported by these data. The public library, professor, family member, and bookstore were not significantly related to the type of course requirement.

The final column of Table 10 identifies significantly different groups of course requirements, using the Scheffé method. The Scheffé method enables one to make pairwise comparisons and is used when the sample sizes are not equal. The Scheffé method is more rigorous than other related procedures, and it leads to fewer significant results. Accordingly, Ferguson (1969) notes that "because this is so, the investigator may choose to employ a less rigorous significance level in using the Scheffé procedure; that is, the .10 level may be used instead of the .05 level" (p. 269). This follows Scheffé's own recommendation.

Each course requirement was compared with the other course requirements for each of the information sources chosen by respondents. The results indicate that term papers differed significantly from labs and exams in importance for the information source special library. That is, students considered the special library to be a more important source of information for term papers than for labs or exams. Term papers differed significantly from labs in importance for department library. For the source, university library, all course requirements differed significantly in importance from exams. Students did not choose the university library as a source of information for exams. An expert in the field was likely to be chosen for term papers but not for labs. A teaching assistant was significantly more important to students for labs than for other course requirements. A friend or classmate were more important sources of information to students for labs than for term papers, while one's personal library was more important for assignments than for seminars.

Table 10 also presents the mean importance of each information source for each course requirement. The table shows that the university library was the most important source of information for all types of course requirements. A student's personal library was also considered to be an important source of information for assignments, exams, and beyond course requirements. A teaching assistant was important for information concerning labs. The public library and bookstore were not important sources of information for any type of course requirement. These data are consistent with the data obtained from the Scheffé method.

ii) Hypothesis 2

This research hypothesis predicted a significant difference between the information sources chosen by first-year and fourth-year students.

On the basis of the data, the null hypothesis was partially rejected; therefore, the research hypothesis was partially supported. (See Tables 11 through 16.)

The first hypothesis -- supported by the data -- affirmed the existence of a relationship between information source chosen and type of course requirement. In light of this relationship, all subsequent statistical testing was conducted according to course requirement, so that this variable was held constant. The difference between information sources chosen by first-year and fourth-year students was analysed using a two-tailed t-test. The results are presented in Tables 11 through 16, one table for each course requirement.

Table 11 suggests that the information sources special library, department library, expert in the field, teaching assistant, and family member differed signficantly in importance between first-year students and fourth-year students for the course requirement assignments. The special library, department library, expert in the field , and teaching assistant were more important sources of information for fourth-year students than for first-year students, while a family member was a more important information source for first-year students.

Table 12 indicates that the information sources department library, university library, expert in the field, and professor differed significantly in importance between first-year and fourth-year students, for the course requirement labs. These information sources were more important to fourth-year students.

The results in Table 13 suggest that the information sources special library, department library, and professor differed significantly in importance between first-year and fourth-year students for the course requirement term

TABLE 11
DIFFERENCE BETWEEN INFORMATION SOURCES CHOSEN BY FIRST-YEAR (N=47) AND FOURTH-YEAR (N=62) STUDENTS FOR ASSIGNMENTS

INFORMATION SOURCES	YEAR OF PROGRAM	MEAN IMPORTANCE	STANDARD DEVIATION	t-VALUE	P
Public	First Fourth	1.30 1.11	.59 .32	1.95	.055
Special	First Fourth	1.30 1.84	.62 .71	-4.17	.000
Department	First Fourth	1.19 2.11	.45 .75	-7.98	.000
University	First Fourth	2.53 2.63	.62 .63	-0.80	.426
Expert	First Fourth	1.26 1.66	.49 .72	-3.50	.001
Professor	First Fourth	1.87 1.92	.74 .66	-0.35	.728
TA	First Fourth	1.34 1.65	.64 .68	-2.38	.019
Family	First Fourth	1.43 1.11	.72 .32	2.80	.007
Friend	First Fourth	1.79 1.71	.75 .64	0.58	.561
Personal	First Fourth	2.13 2.06	.82 .70	0.43	.666
Bookstore	First Fourth	1.09 1.13	.28 .38	-0.69	.492

Mean Importance Scale:
1.00 not important
2.00 moderately important
3.00 very important

TABLE 12
DIFFERENCE BETWEEN INFORMATION SOURCES CHOSEN BY FIRST-YEAR (N=26) AND FOURTH-YEAR (N=48) STUDENTS FOR LABS

INFORMATION SOURCES	YEAR OF PROGRAM	MEAN IMPORTANCE	STANDARD DEVIATION	t-VALUE	P
Public	First Fourth	1.04 1.10	.20 .37	-1.00	.323
Special	First Fourth	1.15 1.42	.46 .61	-1.91	.060
Department	First Fourth	1.15 1.85	.54 .80	-4.46	.000
University	First Fourth	1.92 2.50	.89 .65	-3.18	.002
Expert	First Fourth	1.15 1.48	.46 .68	-2.42	.018
Professor	First Fourth	1.35 2.06	.69 .78	-3.91	.000
TA	First Fourth	2.15 1.98	.78 .79	0.91	.364
Family	First Fourth	1.27 1.06	.60 .25	1.67	.105
Friend	First Fourth	1.81 1.85	.80 .74	-0.25	.803
Personal	First Fourth	1.69 1.85	.84 .74	-0.85	.395
Bookstore	First Fourth	1.15 1.04	.54 .20	1.02	.318

Mean Importance Scale:
1.00 not important
2.00 moderately important
3.00 very important

TABLE 13
DIFFERENCE BETWEEN INFORMATION SOURCES CHOSEN BY FIRST-YEAR (N=22) AND FOURTH-YEAR (N=65) STUDENTS FOR TERM PAPERS

INFORMATION SOURCES	YEAR OF PROGRAM	MEAN IMPORTANCE	STANDARD DEVIATION	t-VALUE	P
Public	First	1.27	.63	1.03	.313
	Fourth	1.12	.45		
Special	First	1.41	.80	-3.52	.001
	Fourth	2.09	.79		
Department	First	1.27	.70	-4.58	.000
	Fourth	2.17	.82		
University	First	2.59	.73	-0.05	.961
	Fourth	2.60	.75		
Expert	First	1.50	.74	-1.19	.237
	Fourth	1.74	.83		
Professor	First	1.41	.59	-2.85	.005
	Fourth	1.91	.74		
TA	First	1.32	.65	-0.98	.332
	Fourth	1.48	.66		
Family	First	1.27	.55	1.06	.299
	Fourth	1.14	.39		
Friend	First	1.55	.67	0.62	.535
	Fourth	1.45	.64		
Personal	First	1.64	.85	-1.46	.147
	Fourth	1.92	.78		
Bookstore	First	1.09	.29	-0.38	.703
	Fourth	1.12	.45		

Mean Importance Scale: 1.00 not important
2.00 moderately important
3.00 very important

TABLE 14
DIFFERENCE BETWEEN INFORMATION SOURCES CHOSEN BY FIRST-YEAR (N=18) AND FOURTH-YEAR (N=22) STUDENTS FOR EXAMS

INFORMATION SOURCES	YEAR OF PROGRAM	MEAN IMPORTANCE	STANDARD DEVIATION	t-VALUE	P
Public	First	1.11	.32	0.17	.869
	Fourth	1.09	.43		
Special	First	1.22	.55	-0.73	.471
	Fourth	1.36	.66		
Department	First	1.22	.65	-1.67	.104
	Fourth	1.59	.73		
University	First	1.72	.75	-0.54	.595
	Fourth	1.86	.89		
Expert	First	1.22	.55	-0.03	.977
	Fourth	1.23	.53		
Professor	First	1.50	.86	-2.02	.051
	Fourth	2.05	.84		
TA	First	1.50	.79	-0.36	.720
	Fourth	1.59	.80		
Family	First	1.22	.65	1.11	.280
	Fourth	1.05	.21		
Friend	First	1.78	.81	0.54	.595
	Fourth	1.64	.85		
Personal	First	1.67	.91	-2.51	.017
	Fourth	2.36	.85		
Bookstore	First	1.28	.67	0.79	.437
	Fourth	1.14	.47		

Mean Importance Scale: 1.00 not important
2.00 moderately important
3.00 very important

TABLE 15
DIFFERENCE BETWEEN INFORMATION SOURCES CHOSEN BY FIRST-YEAR (N=3) AND FOURTH-YEAR (N=24) STUDENTS FOR SEMINARS

INFORMATION SOURCES	YEAR OF PROGRAM	MEAN IMPORTANCE	STANDARD DEVIATION	t-VALUE	P
Public	First	1.00	.00	-0.35	.731
	Fourth	1.04	.20		
Special	First	1.00	.00	-1.29	.209
	Fourth	1.63	.78		
Department	First	1.00	.00	-2.01	.055
	Fourth	1.92	.78		
University	First	1.00	.00	-4.90	.000
	Fourth	2.75	.61		
Expert	First	1.00	.00	-0.80	.431
	Fourth	1.25	.53		
Professor	First	1.00	.00	-2.05	.051
	Fourth	1.79	.66		
TA	First	1.00	.00	-1.28	.213
	Fourth	1.79	.72		
Family	First	1.00	.00	-0.35	.731
	Fourth	1.04	.20		
Friend	First	1.00	.00	-1.08	.288
	Fourth	1.42	.65		
Personal	First	1.00	.00	-1.29	.209
	Fourth	1.50	.66		
Bookstore	First	1.00	.00	0.00	1.00
	Fourth	1.00	.00		

Mean Importance Scale: 1.00 not important
2.00 moderately important
3.00 very important

TABLE 16
DIFFERENCE BETWEEN INFORMATION SOURCES CHOSEN BY FIRST-YEAR (N=6) AND FOURTH-YEAR (N=14) STUDENTS FOR BEYOND COURSE REQUIREMENTS

INFORMATION SOURCES	YEAR OF PROGRAM	MEAN IMPORTANCE	STANDARD DEVIATION	t-VALUE	P
Public	First	1.00	.00	-1.59	.130
	Fourth	1.50	.76		
Special	First	1.83	.98	0.65	.524
	Fourth	1.57	.76		
Department	First	1.50	.84	-1.10	.284
	Fourth	2.00	.96		
University	First	2.50	.84	0.00	1.00
	Fourth	2.50	.65		
Expert	First	1.00	.00	-1.60	.127
	Fourth	1.43	.65		
Professor	First	1.00	.00	-2.39	.028
	Fourth	1.86	.86		
TA	First	1.00	.00	-1.36	.191
	Fourth	1.36	.63		
Family	First	1.67	.82	1.16	.262
	Fourth	1.29	.61		
Friend	First	1.17	.41	-1.72	.103
	Fourth	1.71	.73		
Personal	First	1.83	.98	-0.57	.592
	Fourth	2.07	.48		
Bookstore	First	1.17	.41	0.13	.898
	Fourth	1.14	.36		

Mean Importance Scale:
1.00 not important
2.00 moderately important
3.00 very important

papers. Each of these information sources was more important to fourth-year students than to first-year students.

Table 14 shows that the information source personal library was significantly more important for the course requirement exams for fourth-year students than for first-year students.

Table 15 suggests that the information source university library differed significantly in importance between first-year students and fourth-year students for the course requirement seminars. Fourth-year students considered the university library to be extremely important for seminars.

The data in Table 16 indicate that the information source professor was significantly more important for beyond course requirements for fourth-year students than for first-year students.

Discussion

The above results show that the type of course requirement influenced student choice of information source. The results obtained are, for the most part, what one would expect. One would predict that students would choose libraries as a source of information for term papers rather than for labs and exams. Term papers usually require a literature search which is best accomplished at a library. A teaching assistant usually teaches labs, therefore students would be expected to choose a teaching assistant for information regarding labs. It is surprising, however, that a professor was not a significantly important source of information for any type of class requirement, although students considered a professor to be important generally. Students, therefore, may approach a professor for more general information, rather than for course requirement information. In summary, the type of course requirement determined the type of information source chosen.

These results cannot be compared to the results of previous studies, as other studies have not investigated the relationship between course requirements and choice of information sources.

It was discovered that the university library was considered to be a very important information source by the majority of respondents. Personal library, department library, and professor were also considered to be very important sources of information. The information sources public library, bookstore, and family member were either not important, or the respondents did not choose them for information. These results, for the most part, support Dunn's (1984). In her study, students ranked teacher as the most important source in satisfying information needs, followed by college and university library, expert in the field, and personal library. In the present study, the university library was the most important, but expert in the field was rated by the majority of the respondents as not important or not used. Dunn had concluded that authoritative, informal sources are often chosen first, followed by authoritative, formal sources (p. 141). The data from the present study suggest that such a distinction cannot be made. Students chose not only formal sources, such as the university library and department library, but they also chose authoritative, informal sources such as professor and teaching assistant.

The present data may be compared to data from previous studies regarding the information seeking behavior of scientists and researchers. The subjects from the present study were in a scientific mission-oriented field, rather than in a technical field. These results are consistent with Allen's (1966) results. Allen discovered that scientists and technologists differ in their choice of information source: technologists chose informal sources more readily than formal sources. The reverse was true for scientists. The data in the present study suggest that the students deemed a formal source, the university library, as the most important information source for their course requirement information needs.

The results from the present study suggest that students were not concerned whether an information source was formal or informal, but rather their choice of information source was determined by the type of course requirement for which information was needed.

The data in Tables 11 through 16 suggest that some of the information sources chosen by first-year students and fourth-year students differed significantly in importance, as analysed in light of course requirements. Generally, fourth-year students considered special and department libraries to be significantly more important as information sources than did first-year students, while first-year students thought a family member to be a more important source of information than did fourth-year students.

These results suggest that fourth-year students were more aware of the different information sources available to them, than were first-year students. Many first-year students may not know that special and department libraries are available since their course requirements, usually assignments, do not demand that they seek information from other libraries. In addition, many first-year students are just out of high school, so may still be living at home; therefore, a family member as an information source may be more prominent for them than for fourth-year students.

These results are, in part, consistent with previous use and user studies. Previous studies have suggested that the greatest difference in library use is found between first-year and fourth-year students. Although both first-year students and fourth-year students stated that the university library was the most important information source, the subjects differed significantly in their perceived importance of other information sources. In summary, some significant differences existed between the information sources chosen by first-year students and fourth-year students.

3) Psychological Needs

Students were asked to rate the extent to which psychological needs influenced them to seek information using a rating scale of strong influence, moderate influence, and no influence. Tables 17 and 18 show the responses of first-year and fourth-year students, respectively. (For a complete representation of the data relating to psychological needs, see Appendix I.)

The tables reveal that students in both years rated "good grades" (N1) as the strongest influence on their search for information. The proportions were 61 percent of first-year students and 70 percent of fourth-year students. "Personal satisfaction" (N17) was also an influential psychological need for both groups, with 39 percent of first-year students and 45 percent of fourth-year students rating it as a strong influence.

Other needs which were considered to be of strong influence by both first-year and fourth-year students included: "knowing more about the subjects that interest one" (N5), "fulfilling personal goals' (N4), "feeling good about oneself" (N12), and "having a broader understanding of the subjects that relate to one's profession" (N21).

Table 19 provides a rank ordering of student ratings of psychological needs, comparing first-year students and fourth-year students. The Table shows only the strong influence ratings. For the most part, the rank ordering is very similar for both groups. The major difference in the ranks is for "getting everything one can out of one's university education" N3. This was ranked 7th by fourth-year students, but only 14th by first-year students. Another difference

TABLE 17
PSYCHOLOGICAL NEEDS INFLUENCING FIRST-YEAR STUDENTS TO SEEK INFORMATION

PYSCHOLOGICAL NEEDS		DEGREE OF INFLUENCE ON INFORMATION SEEKING									
		Strong		Moderate		None		No Response		Total	
		#	%	#	%	#	%	#	%	#	%
N1	Grades	35	61	13	23	2	4	7	12	57	100
N2	Outlook	1	2	29	51	19	33	8	14	57	100
N3	Education	5	9	33	58	10	17	9	16	57	100
N4	Goals	17	30	23	40	9	16	8	14	57	100
N5	Knowing	19	33	25	44	5	9	8	14	57	100
N6	Help Others	1	2	19	33	29	51	8	14	57	100
N7	Smart	1	2	11	19	37	65	8	14	57	100
N8	Exams	0	0	11	19	38	67	8	14	57	100
N9	Job	9	16	20	35	19	33	9	16	57	100
N10	Money	8	14	20	35	21	37	8	14	57	100
N11	Expect.	8	14	19	33	22	39	8	14	57	100
N12	Good	15	26	25	44	8	14	9	16	57	100
N13	Proving	4	7	16	28	29	51	8	14	57	100
N14	Person	2	4	17	30	28	49	10	17	57	100
N15	Frustration	9	16	33	58	7	12	8	14	57	100
N16	Professor	3	5	7	12	39	69	8	14	57	100
N17	Personal	22	39	23	40	5	9	7	12	57	100
N18	Better	13	23	23	40	12	21	9	16	57	100
N19	Ideas	1	2	16	28	32	56	8	14	57	100
N20	Secure	5	9	23	40	21	37	8	14	57	100
N21	Understand	13	23	25	44	10	17	9	16	57	100
N22	Mental	10	18	27	47	12	21	8	14	57	100
N23	Equal	6	10	17	30	25	44	9	16	57	100

TABLE 18
PSYCHOLOGICAL NEEDS INFLUENCING FOURTH-YEAR STUDENTS TO SEEK INFORMATION

PYSCHOLOGICAL NEEDS		DEGREE OF INFLUENCE ON INFORMATION SEEKING									
		Strong		Moderate		None		No Response		Total	
		#	%	#	%	#	%	#	%	#	%
N1	Grades	48	70	16	23	1	1	4	6	69	100
N2	Outlook	7	10	40	58	17	25	5	7	69	100
N3	Education	14	20	41	59	8	12	6	9	69	100
N4	Goals	31	45	28	41	5	7	5	7	69	100
N5	Knowing	33	48	29	42	2	3	5	7	69	100
N6	Help Others	6	9	32	46	25	36	6	9	69	100
N7	Smart	3	4	13	19	48	70	5	7	69	100
N8	Exams	3	4	6	9	53	77	7	10	69	100
N9	Job	14	20	31	45	19	28	5	7	69	100
N10	Money	6	9	17	25	41	59	5	7	69	100
N11	Expect.	9	12	28	41	28	41	4	6	69	100
N12	Good	22	32	36	52	7	10	4	6	69	100
N13	Proving	4	6	30	44	30	44	5	7	69	100
N14	Person	6	9	21	30	37	54	5	7	69	100
N15	Frustration	13	19	28	41	23	33	5	7	69	100
N16	Professor	2	3	23	33	40	58	4	6	69	100
N17	Personal	31	45	30	44	3	4	5	7	69	100
N18	Better	13	19	40	58	12	17	4	6	69	100
N19	Ideas	8	12	23	33	34	49	4	6	69	100
N20	Secure	10	15	29	42	25	36	5	7	69	100
N21	Understand	33	48	24	34	8	12	4	6	69	100
N22	Mental	13	19	36	52	16	23	4	6	69	100
N23	Equal	2	3	31	45	32	46	4	6	69	100

TABLE 19
RANK ORDERING OF PSYCHOLOGICAL NEEDS INFLUENCING STUDENTS TO SEEK INFORMATION

PSYCHOLOGICAL NEEDS		RANK MOST TO LEAST INFLUENTIAL First-Year	Fourth-Year
N1	Grades	1	1
N17	Personal	2	5
N5	Knowing	3	2
N4	Goals	4	4
N12	Good	5	6
N18	Better	6	10
N21	Understand	7	3
N22	Mental	8	11
N9	Job	9	8
N15	Frustration	10	9
N10	Money	11	17
N11	Expect.	12	13
N23	Equal	13	23
N3	Eductation	14	7
N20	Secure	15	12
N13	Proving	16	19
N16	Professor	17	22
N14	Person	18	18
N2	Outlook	19	15
N6	Help Others	20	16
N7	Smart	21	20
N19	Ideas	22	14
N8	Exams	23	21

in the relative ranking is evident with "need to feel equal to others" N23 which was ranked 13th by first-year students and 23rd by fourth-year students.

i) Hypothesis 3

This research hypothesis predicted a significant difference between the motivating psychological needs of first-year and fourth-year students.

On the basis of the data, the null hypothesis was partially rejected; therefore, the research hypothesis was partially supported. (See Table 20.)

The difference between the motivating psychological needs of first-year students and fourth-year students was analyzed using a two-tailed t-test. Table 20 reveals that the following psychological needs were significantly more influential for fourth-year students than for first-year students:

1) having a broader outlook toward life and people (N2),
2) getting everything one can out of one's university education (N3),
3) fulfilling personal goals (N4),
4) knowing more about the subjects that interest one (N5),
5) being able to help others (N6),
6) challenging the ideas of the professor and asking more intelligent questions (N19), and
7) having a broader understanding of the subjects that relate to the profession (N21).

Table 20 also illustrates the mean influence and standard deviation for the psychological needs for both groups of respondents. Students reported that "getting good grades" (N1) was the most influential psychological need on information seeking. "Getting good grades" had a mean influence of 2.55 and 2.62 for first-year students and fourth-year students respectively. The mean

TABLE 20
t-TEST OF PSYCHOLOGICAL NEEDS AND YEAR OF PROGRAM

PSYCHOLOGICAL NEEDS		FIRST-YEAR N=57		FOURTH-YEAR N=69		PROBABILITY	
		Mean Influence	Standard Deviation	Mean Influence	Standard Deviation	t Value	P
N1	Grades	2.55	.76	2.62	.62	-1.36	.176
N2	Outlook	1.59	.53	1.78	.62	-2.30	.023
N3	Education	1.75	.61	2.00	.64	-2.19	.030
N4	Goals	2.00	.78	2.30	.71	-2.29	.024
N5	Knowing	2.11	.75	2.38	.67	-2.15	.033
N6	Help Others	1.37	.52	1.64	.64	-2.55	.012
N7	Smart	1.23	.46	1.28	.54	-0.52	.603
N8	Exams	1.19	.40	1.17	.48	0.24	.812
N9	Job	1.67	.74	1.86	.73	-1.43	.155
N10	Money	1.63	.72	1.42	.65	1.72	.087
N11	Expect.	1.61	.73	1.67	.70	-0.41	.680
N12	Good	1.96	.76	2.16	.68	-1.52	.130
N13	Proving	1.42	.63	1.55	.61	-1.18	.241
N14	Person	1.37	.56	1.48	.66	-1.00	.318
N15	Frustration	1.89	.65	1.78	.75	0.89	.374
N16	Professor	1.23	.54	1.39	.55	-1.68	.095
N17	Personal	2.18	.76	2.33	.68	-1.23	.220
N18	Better	1.86	.77	1.96	.65	-0.77	.445
N19	Ideas	1.32	.51	1.57	.70	-2.33	.022
N20	Secure	1.58	.63	1.71	.71	-1.07	.286
N21	Understand	1.89	.75	2.30	.75	-3.05	.003
N22	Mental	1.82	.71	1.90	.69	-0.59	.555
N23	Equal	1.51	.69	1.51	.56	0.01	.989

Mean Influence Scale: 1.00 no influence
2.00 moderate influence
3.00 strong influence

influence for the need "knowing more about the subjects that interest one" (N5) was 2.11 for first-year students and 2.38 for fourth-year students. In addition, the t-test demonstrated that this need differed significantly in influence for the two groups. The least influential need for both sets of students was "knowing for professional/ standardized exams and meeting professional school requirements" (N8).

ii) Hypothesis 4

This research hypothesis predicted a significant relationship between the information sources chosen by students and their motivating psychological needs.

On the basis of the data, the null hypothesis was partially rejected; therefore, the research hypothesis was partially supported. (See Tables 21 through 26.)

In order to determine whether a relationship existed between information sources and psychological needs, a Pearson's product moment correlation test was conducted. Again, as it was previously shown that course requirements influence the choice of information source, data are presented in light of each course requirement. Tables 21 through 26 show the significant relationships. To focus on the most important findings, only those variables that were significantly related to four or more other variables are discussed.

Table 21 illustrates the significant relationships between information sources and psychological needs for the course requirement assignments. The information sources teaching assistant and university library were significantly related to the most psychological needs. The psychological need "having a broader understanding of the subjects that relate to my profession" (N21), was significantly related to the most information sources.

TABLE 21
PEARSON CORRELATION COEFFICIENT BETWEEN PSYCHOLOGICAL NEEDS AND INFORMATION SOURCE FOR ALL STUDENTS FOR ASSIGNMENTS (N= 106)

PSYCHOLOGICAL NEEDS		INFORMATION SOURCES										
		Pblc	Spcl	Dept	Univ	Expt	Prof	TA	Fmly	Frnd	PrLb	Bkst
N1	Grades										.028	.000
N2	Outlook			.022	.049							
N3	Education							.001				
N4	Goals				.001			.000				.043
N5	Knowing											
N6	Help Others											
N7	Smart									.033		
N8	Exams									.029		
N9	Job											
N10	Money											
N11	Expect.								.008			
N12	Good				.017			.000				
N13	Proving		.035									
N14	Person			.046								
N15	Frustration						.025			.041	.028	
N16	Professor											
N17	Personal				.000			.043				
N18	Better				.013			.004			.023	
N19	Ideas			.044			.034	.004				
N20	Secure											
N21	Understand		.008	.012		.029		.038			.007	
N22	Mental							.000				
N23	Equal		.035									

only significant variables shown

TABLE 22
PEARSON CORRELATION COEFFICIENT
BETWEEN PSYCHOLOGICAL NEEDS AND INFORMATION SOURCES
FOR ALL STUDENTS FOR LABS (N= 71)

PSYCHOLOGICAL NEEDS		INFORMATION SOURCES										
		Pblc	Spcl	Dept	Univ	Expt	Prof	TA	Fmly	Frnd	PrLb	Bkst
N1	Grades								.025		.013	
N2	Outlook			.019								
N3	Education				.006			.004				
N4	Goals						.037	.001	.046			
N5	Knowing	.007						.026				
N6	Help Others											
N7	Smart											
N8	Exams			.001								
N9	Job			.009								
N10	Money							.016				
N11	Expect.							.040				
N12	Good	.045			.002		.031	.031	.029			
N13	Proving						.028					
N14	Person						.009					
N15	Frustration						.025	.004				
N16	Professor						.007					
N17	Personal						.027		.001			
N18	Better	.044		.012			.025	.047				
N19	Ideas			.009			.001					
N20	Secure						.017					
N21	Understand			.012			.037	.016				
N22	Mental			.018					.041			
N23	Equal											

only significant variables shown

TABLE 23
PEARSON CORRELATION COEFFICIENT BETWEEN PSYCHOLOGICAL NEEDS AND INFORMATION SOURCES FOR ALL STUDENTS FOR TERM PAPERS (N= 85)

PSYCHOLOGICAL NEEDS		INFORMATION SOURCES										
		Pblc	Spcl	Dept	Univ	Expt	Prof	TA	Fmly	Frnd	PrLb	Bkst
N1	Grades										.025	
N2	Outlook										.002	.043
N3	Education							.007				
N4	Goals				.023						.043	
N5	Knowing										.015	
N6	Help Others											
N7	Smart						.027					
N8	Exams			.037								
N9	Job											
N10	Money				.026							
N11	Expect.						.002	.009		.022		
N12	Good							.036				
N13	Proving						.041					
N14	Person		.047									.012
N15	Frustration						.030	.046				
N16	Professor						.043					
N17	Personal				.007				.037		.003	
N18	Better							.025				
N19	Ideas			.047			.007					
N20	Secure											
N21	Understand		.010			.026					.007	
N22	Mental							.027				
N23	Equal											

only significant variables shown

TABLE 24
PEARSON CORRELATION COEFFICIENT BETWEEN PSYCHOLOGICAL NEEDS AND INFORMATION SOURCES FOR ALL STUDENTS FOR EXAMS (N= 38)

PSYCHOLOGICAL NEEDS		INFORMATION SOURCES										
		Pblc	Spcl	Dept	Univ	Expt	Prof	TA	Fmly	Frnd	PrLb	Bkst
N1	Grades							.045		.001		
N2	Outlook							.039				
N3	Education			.035	.046							
N4	Goals			.009	.049			.003			.002	
N5	Knowing										.008	
N6	Help Others			.008				.018				
N7	Smart											
N8	Exams				.043							
N9	Job							.029				
N10	Money											
N11	Expect.			.002								
N12	Good			.009	.049							
N13	Proving											
N14	Person											
N15	Frustration			.003								
N16	Professor						.034					
N17	Personal			.020				.013			.004	
N18	Better				.025			.021				
N19	Ideas						.022	.024			.021	
N20	Secure							.023				
N21	Understand			.005			.048	.013			.000	
N22	Mental			.049			.013	.001				
N23	Equal											

only significant variables shown

TABLE 25
PEARSON CORRELATION COEFFICIENT BETWEEN PSYCHOLOGICAL NEEDS AND INFORMATION SOURCES FOR ALL STUDENTS FOR SEMINARS (N= 26)

PSYCHOLOGICAL NEEDS		INFORMATION SOURCES										
		Pblc	Spcl	Dept	Univ	Expt	Prof	TA	Fmly	Frnd	PrLb	Bkst
N1	Grades										.042	
N2	Outlook											
N3	Education											
N4	Goals		.026				.039					
N5	Knowing								.021			
N6	Help Others											
N7	Smart											
N8	Exams											
N9	Job											
N10	Money											
N11	Expect.											
N12	Good											
N13	Proving											
N14	Person	.015		.012				.047				
N15	Frustration						.042					
N16	Professor											
N17	Personal										.042	
N18	Better											
N19	Ideas											
N20	Secure										.038	
N21	Understand		.026	.017								
N22	Mental			.006								
N23	Equal											

only significant variables shown

TABLE 26
PEARSON CORRELATION COEFFICIENT BETWEEN PSYCHOLOGICAL NEEDS AND INFORMATION SOURCES FOR ALL STUDENTS FOR BEYOND COURSE REQUIREMENTS (N= 18)

PSYCHOLOGICAL NEEDS		INFORMATION SOURCES										
		Pblc	Spcl	Dept	Univ	Expt	Prof	TA	Fmly	Frnd	PrLb	Bkst
N1	Grades		.012									
N2	Outlook											
N3	Education								.022			
N4	Goals									.048		
N5	Knowing				.031							
N6	Help Others							.027		.009		
N7	Smart			.011								
N8	Exams											
N9	Job		.006									
N10	Money		.014					.018				
N11	Expect.											
N12	Good			.023					.012			
N13	Proving		.024									
N14	Person								.015			
N15	Frustration							.044		.002		
N16	Professor											
N17	Personal											
N18	Better		.009	.011	.018							
N19	Ideas							.027				
N20	Secure							.012				
N21	Understand											
N22	Mental								.014			
N23	Equal											

only significant variables shown

Table 22 provides the significant relationships between information sources and psychological needs for the course requirement labs. The information sources teaching assistant, professor, department library, and family member were significantly related to the most psychological needs. The psychological needs "feeling good about myself" (N12), and "doing better in upcoming classes" (N18), were significantly related to the most information sources.

Table 23 shows the significant relationships between information sources and psychological needs for the course requirement term papers. The information sources professor, teaching assistant, and personal library were significantly related to the most psychological needs. There does not appear to be any psychological need that was significantly related to a number of information sources.

Table 24 shows the significant relationships between information sources and psychological needs for the course requirement exams. The information sources department library, university library, professor, teaching assistant, and personal library were significantly related to the most psychological needs. The psychological needs, "fulfilling personal goals"(N4), and "having a broader understanding of the subjects that relate to my profession" (N21), were significantly related to the most information sources.

Table 25 illustrates the significant relationships between information sources and psychological needs for the course requirement seminars. There does not seem to be any information source that was significantly related to a number of psychological needs. In addition, no one psychological need was significantly related to any of the information sources.

Table 26 provides the significant relationships between information sources and psychological needs for beyond course requirements. The information sources teaching assistant and special library had significant relationships with the most psychological needs. There does not, however, appear to be any one psychological need that was significantly related to any of the information sources.

Discussion

The data analyzed above show that, for the most part, the psychological needs which influenced first-year and fourth-year students to search for information were similar. "Getting good grades" (N1), "personal satisfaction" (N17), and "knowing more about the subjects that interest one" (N5) were the most influential psychological needs for both groups.

Dunn (1984) discovered that information seeking is motiviated by psychological needs. She determined that needs related to intellectual stimulation were the most influential in an undergraduate student's search for information, followed by needs related to self-approval. Needs related to a successful college experience was ranked 5th out of 6 possible 'need factors'. In this last need factor, the individual need, "to get good grades", was included.

In contrast to Dunn's findings the students in the present investigation suggested that "getting good grades" was the most influential psychological motivation for seeking information. "Personal satisfaction" and "knowing more about the subjects that interest one" were included in Dunn's 'need factor', need for intellectual stimulation, which was ranked as the most influential. This finding is consistent with the present study's results.

Dunn had suggested that students sought information because they seek approval, knowledge, success, mental and spiritual challenge. The present study, however, suggests that students sought information in order to satisfy their course requirements, rather than to satisfy these more personal psychological needs. This is consistent with the fact that the respondents stated that "getting good grades" was the most influential psychological need.

It was also discovered that there was a significant difference between some psychological needs that infuence first-year and fourth-year students to search for information. One would expect fourth-year students to be more concerned than first-year students with their future in the profession because of their imminent entry into the work force. Psychological needs that relate to the future include: "developing a broader outlook toward life and people" (N2), "getting everything one can out of one's university education"(N3), "fulfilling personal goals" (N4), "competing better in the job market" (N9), "feeling secure about the future" (N20), and "having a broader understanding of the subjects that relate to one's profession" (N21). The above needs were found to be significantly more influential for fourth-year students than for first-year students.

In contrast to this pattern among fourth-year students, one would expect first-year students to be more influenced by needs that relate to their insecurity of being in their first year of university, than their concern about the future. These needs include: "having others think one is smart" (N7), "meeting the expectations of others" (N11), "proving oneself to others" (N13), "avoiding feeling frustrated by a lack of knowledge" (N15), and "feeling equal to others" (N23). However, it was discovered that none of the above needs were significantly more influential for first-year students than for fourth-year students.

The present study investigated whether significant relationships existed between motivating psychological needs and the choice of information source by using the statistical test Pearson Product Moment Correlation Coefficient. The results suggest that some information sources were related to some psychological needs, but trends were not evident. That is, the results seem to be scattered, rather than concentrated on the same psychological needs and information sources across course requirements.

Dunn (1984) determined that her 'need factors', as defined previously, were related to student choice of information source. Her results indicated that psychological needs that require personal interaction with people were correlated with informal, impersonal sources, such as family and friends, who would provide this interaction. Psychological needs that require cognitive ability, accomplishment, and satisfaction were correlated with formal and informal sources, such as libraries and experts, which would provide reliable information.

In the present study, the information sources public library, expert in the field, friend and classmate, and bookstore were significantly related to the fewest psychological needs. This contrasts, in part, Dunn's results. In her study, both friends and experts were significantly correlated with psychological needs that related to other approval and self extension, and intellection stimulation and professional success respectively.

The remaining information sources in the present investigation, special library, department library, university library, professor, teaching assistant, family member, and personal library were related to a variety of psychological needs. The psychological needs"having a broader understanding of the subjects that relate to my profession" (N21), "doing better in upcoming classes" (N18), and "fulfilling personal goals" (N4) showed the most significant relationships with these information sources, which included both formal and informal sources. This is in contrast to Dunn's results.

It is also interesting to note that the psychological needs that the students indicated influenced them to seek information somewhat reflect the above discussion. The three prominent psychological needs "fulfilling personal goals"

(N4), "doing better in upcoming classes" (N18), and "having a broader understanding of the subjects that relate to one's profession" (N21) were ranked as 4th, 6th, and 7th in influence by first-year students and 4th, 10th, and 3rd in influence by fourth-year students, respectively. However, the psychological need"getting good grades" (N1), which was ranked as the most influential in seeking information by both first-year and fourth-year students, displayed very few significant relationships with any of the information sources.

In summary, then, this study has shown that psychological needs do not strongly influence the student's choice of information source. Rather, course requirements influenced the student's choice. At the same time, however, the study also shows that a few psychological needs did motivate students to seek information. These needs were: "getting good grades", "personal satisfaction", and "fulfilling personal goals".

4) Bibliographic Instruction and Demographic Data

The students were asked if they had taken any courses, seminars, or lectures on how to find information, and whether the course, seminar, or lecture had been effective in teaching the students how to find information.

Table 27 shows that 59 percent of both first-year and fourth-year students had taken a bibliographic instruction course. Of those who had, 79 percent of first-year students and 71 percent of fourth-year students stated that their bibliographic instruction course had been effective in teaching them how to find information. (See Table 28.)

TABLE 27
BIBLIOGRAPHIC INSTRUCTION COURSES TAKEN BY FIRST-YEAR AND FOURTH-YEAR STUDENTS

RESPONSE	FIRST-YEAR STUDENTS		FOURTH-YEAR STUDENTS	
	#	%	#	%
Yes	34	59%	41	59%
No	22	39	28	41
No Response	1	2	0	0
Total	57	100%	69	100%

TABLE 28
EFFECTIVENESS OF BIBLIOGRAPHIC INSTRUCTION COURSES TAKEN BY FIRST-YEAR AND FOURTH-YEAR STUDENTS

RESPONSE	FIRST-YEAR STUDENTS		FOURTH-YEAR STUDENTS	
	#	%	#	%
Yes	27	79%	29	71%
No	1	3	5	12
Not Sure	2	6	6	15
No Response	4	12	1	2
Total	34	100%	41	100%

i) Hypothesis 5

This research hypothesis predicted a significant difference between the information sources chosen by students who had been exposed to bibliographic instruction and students who had not.

On the basis of the data, the null hypothesis was accepted; therefore, the research hypothesis was not supported.

A t-test showed no significant differences existed between the information sources chosen by students who had taken a bibliographic instruction course and those who had not taken one; therefore a table illustrating this is not provided. Separate t-tests were conducted on several variables: first, whether students had taken a bibliographic instruction course; next, whether they had taken AGFOR 201; and finally, whether they had taken AGFOR 204. The two courses, AGFOR 201 and 204 were included as they contain a bibliographic instruction component. All t-tests indicated that there was no significant difference between the above variables and choice of information source.

ii) Hypothesis 6

This research hypothesis predicted a significant difference between the information sources chosen by students and their academic institution of first year attendance.

On the basis of the data, the null hypothesis was accepted; therefore, the research hypothesis was not supported.

It was discovered that there was no significant difference between academic institution attended and information sources chosen. Table 29 shows the number and percent of fourth-year students who attended an institution other than the University of Alberta for their first year of study.

TABLE 29
ATTENDANCE AT AN ACADEMIC INSTITUTION
OTHER THAN THE UNIVERSITY OF ALBERTA

RESPONSE	FOURTH-YEAR STUDENTS	
	#	%
Yes	38	55%
No	31	45
No Response	0	0
Total	69	100%

Discussion

It is interesting to note that there was no significant difference between students who had been exposed to bibliographic instruction courses and those students who had not in the choice of information sources. One would expect that the students who had received formal instruction on how to locate information in a library would deem a library to be an important information source. The data show that the majority of students considered the university library to be the most important source of information, regardless of whether or not they had taken a bibliographic instruction course.

In addition, the results suggest that first year attendance at an academic institution other than the University of Alberta did not play a role in a fourth-year student's choice of information source.

C. QUALITATIVE DATA

Qualitative data findings are presented in three parts: problems in finding information, most important information sources, and interview information.

1) Problems in Finding Information

The questionnaire asked students if they had encountered any problems in finding and getting the information that they required, and, if so, to elaborate. Table 30 shows that 23 percent of the first-year students and 48 percent of the fourth-year students indicated that they did indeed have trouble in finding needed information.

TABLE 30
PROBLEMS IN FINDING INFORMATION
REPORTED BY
FIRST-YEAR AND FOURTH-YEAR STUDENTS

RESPONSE	FIRST-YEAR STUDENTS		FOURTH-YEAR STUDENTS	
	#	%	#	%
Yes	13	23%	33	48%
No	40	70	32	46
No Response	4	7	4	6
Total	57	100%	69	100%

From the comments that were provided by the students all of the problems centered around libraries, particularly university libraries. This is noteworthy because the term 'library' was not used in the question; rather, students were asked about their information problems in general.

Students revealed a variety of specific problems in finding and getting the information that they needed:

1) Information was not available as items had been taken out of the library or had been misplaced. Students complained of the extended loan period for graduate students and academic faculty. One student even

suggested that the Science and Technology Library in Cameron "should not be a circulating library, or loan periods should be drastically reduced".

2) The scientific indexes and abstracts were considered difficult to use, disorganized in their arrangement, very time-consuming, and frustrating. In addition, some students suggested that the indexes and abstracts did not carry material more than 5 or 10 years old, while other students complained that very current information could not be located through the indexes and abstracts.

3) The available material was either too specific or too general.

4) There were difficulties with the online computer catalogue. As one student aptly said, "my main problem is dreaming up headings to find information" on the computer system. Some students also suggested that it was frustrating to use the online computer, "only to discover that the journals or books no longer existed in the library system", referring to lost , misshelved, or weeded books.

5) There were problems in locating the item on the shelves. One student stated: "I usually wander in the library in search of a call number".

Discussion

As mentioned previously, nearly half of the fourth-year students suggested that they had encountered problems in locating the information that they required. This may be attributed to the fact that fourth-year students were more likely to choose libraries, including university, special, and department libraries, for information than were first-year students. All the problems mentioned by the students in the present study centered around the library, particularly the university library.

Problems encountered in finding and getting information centered around the items being on loan, the difficulty of using scientific abstracts and indexes, the nature of the information located (too specific or too general), difficulty with the online computer, and locating the material on the shelves. Librarians may be able to address the above issues, except for perhaps the non-availability of items on loan, during formal bibliographic instruction courses as well as during informal bibliographic instruction, such as at the reference desk. One student stated that he found it "very hard to find anything in the libraries even after I took the orientation class. I had no problem finding information from other sources, people are very helpful".

2) Reasons Why Information Sources Were Important

The questionnaire asked students to indicate which three information sources they thought were the most important to them and why these sources were thought to be important. As previously discussed, the results suggested that the university library was the most important source for the majority of students, both first-year and fourth-year. Public library, bookstore, and family were not considered among the three most important information sources. In addition, fourth-year students deemed special department libraries to be important while first-year students did not. It is interesting to note that the reasons for the importance of information sources provided by both first-year students and fourth-year students did not differ.

The student comments from the open-ended questions on the questionnaire suggested that libraries, including special library, department library, and university library, were chosen as information sources because:

1) They provide specific, up-to-date information.

2) Both the department library and university library are convenient, easily accessible, and familiar to students.

3) The information is easy to find in all three types of libraries and the staff members provide help in searching for information.

4) The university library contains a wide range and variety of scientific information. It provides the greatest amount of information in one central location.

Expert in the field, professor, and teaching assistant were considered to be important sources of information because:

1) They can provide up-to-date information as well as personal insight and experience.

2) They are very helpful and knowledgeable. They can direct and guide one to the proper information sources.

A friend and classmate were considered to be important sources of information because:

1) They are able to provide new ideas and information.

2) They are the easiest from which to obtain information.

The students considered their personal library to be an important source of information because:

1) The texts and class notes correspond with course materials.

2) One's personal library is readily accessible.

3) One's personal library can provide guidance and direction when seeking information in the library.

Discussion

From these comments, it is evident that students chose special and department libraries because they provide very specific and up-to-date information. Students suggested that these libraries have specific technical information related to their field of study and a great deal of practical information related to agriculture. In addition, department library was chosen for information because it was convenient. As one student stated, one department library was important as it was "easily accessed and not ravaged by the masses".

The university library was considered to be important because it provided, as one student observed, "a wide range of related material and it was close at hand". Students are familiar with the university library, and, because students are already on campus, it is very convenient. In addition, the university library was perceived to provide up-to-date information.

These results are interesting because they concur with the results of other researchers (Rosenberg, 1967; Allen, 1977; Friedlander, 1973) that accessiblity, availability, and ease of use are the important factors in choosing an information source. In contrast to Dunn's (1984) findings, students in the present study did not indicate reasons of a psychological nature that motivated them to use libraries. Pragmatic, rather than psychological, reasons influenced students' choice of formal information sources.

It is interesting to note, however, that students chose an expert in the field, professor, and teaching assistant because these informal sources of information can provide personal contact, up-to-date information, and guidance in locating the needed information. The personal contact may be considered to be a psychological, rather than a pragmatic, reason for choosing an information source. This result is consistent with Dunn's (1984) results that students who desire the company of other people will choose informal sources of information. As one student commented, "it is nice to have a one-to-one conversation with someone helpful".

A friend and classmate were also considered to be important sources of information because they provided a chance for the students to exchange ideas and information, and were easily accessible. One student noted that "personal input gives a better viewpoint than just a textbook output". Here, a combination of pragmatic and psychological reasons were evident.

Students suggested that personal libraries were important sources of information as they were relevant to their courses, easily accessible, and provide direction for the use of libraries.

In summary, then, it is evident that students chose information sources, both formal and informal, mainly for pragmatic reasons. At the same time, informal information sources, such as an expert in the field, professor, and teaching assistant, were chosen because they provided the student with a personal, one-on-one contact, and this may be interpreted as a psychological reason.

3) Interview Information

The interview schedule focussed on three main areas of interest: the course requirement for which students spent the most time seeking information, their actual information seeking process, and student perceptions of the University of Alberta Library System. The results were as follows.

i) Course Requirements

The interviewed students were asked if they remembered the course requirement which they specified on the questionnaire, and to provide details about it. As on the questionnaire itself, the majority of the interviewees indicated that they spent the most time seeking information for term papers and assignments. Typically, term papers for fourth-year students were longer and carried a greater percentage of weight for a course than those for first-year students.

ii) Information Seeking Process

The main emphasis of the interview was on the students' information seeking process; that is, what steps the students followed in order to find the necessary information for their course requirements. Students were asked where they went first for their information, and why they chose that particular source.

Results from the interviews suggest that the university library is generally the first information source chosen by both first-year and fourth-year students. Second and third choices included: friend and classmate, expert in the field, professor, and teaching assistant for first-year students; and department and special libraries, professor, and friend and classmate for fourth-year students.

The results show that students were likely to choose a second and third information source only when the necessary information was not found at the first information source. Few students indicated that they continued their search for information once some information had been found, albeit the information located may not have been exaclty what they originally wanted. As one student stated:

> I got all the information necessary but I could have been more thorough if I had had the time. More information than needed is available. I was not concerned with getting all the information that is available as I got enough information to get the lab done and got good marks even though more information was available".

As stated previously both groups of students did not differ in their reasons for choosing certain information sources. In addition, the reasons obtained from the interviews did not differ from the questionnaire responses.

Both first-year and fourth-year students stated that they chose the university library first because:

1) It was the most available, convenient, and accessible information source. Usually the students are already on campus, and it is the most accessible information source.

2) Generally, the university library has all the information that one needs. As one student stated, "lots more information is available than from the public library or personal textbooks".

3) Students also suggested that they choose the university library because they knew where to find the needed information. A student remarked that he "always goes there and it is a good place to start".

Both groups of interviewed students maintained that professor was chosen for information because the professor provided direction and very specific information that may not be found otherwise.

Fourth-year students suggested that department and special libraries were chosen for information because:

1) The materials in a department library supplement those in the University Library System. A copy might be found in the department library which may already be on loan from the university library.

2) Department and special libraries may carry additional, more specific and current information than the university library.

First-year students suggested that they chose a teaching assistant and expert in the field because:

1) The teaching assistant was easily accessible and provided direction and information that was otherwise unavailable.

2) An expert in the field provided very recent information quickly, as well as information related to day-to-day activities that may not be reported in textbooks.

The interviewed students were asked if they thought that they were able to get all the information needed or if gaps existed in the information that they found. In addition, the students were asked if they considered the approach that they used to find information to be the most efficient. The majority of the students stated that they did not perceive any gaps in their information. Students who suggested that there were gaps in their information stated that these were due to the fact that the needed books had already been taken out of the library.

Again, most of the students maintained that their information seeking process was efficient, and resulted in finding the necessary information. Some of the interviewees stated that, in the future, they would start their search for information sooner so that they would not be rushed and the information and books would be available. Several students suggested that in future information seeking, they would rely more heavily upon professors for direction.

Discussion

The results from the interviews suggest that both first-year and fourth-year students go to one of the university libraries as their first step in their information seeking process. Students usually chose secondary or tertiary sources only when adequate information was not obtained from the original source. The results suggest that when students began their search for information, they normally chose the university library, which houses a vast amount and variety of information. When more information was required, they chose other sources such as department and special libraries, professor, and expert in the field. These findings support Allen's (1966) discovery that project phase will influence the information seeking process.

The secondary and tertiary sources of information chosen included both formal and informal sources. These observations support the data from the questionnaire, that students chose both formal and informal sources for their information needs. The results, however, do not readily support Dunn's (1984) contention that students choose authoritative, informal sources first, followed by authoritative, formal sources. Students in the present study chose an authoritative, formal source, the university library, first followed by either informal or other formal sources.

As mentioned previously, the reasons identified in this study for choosing a particular information source were consistent with those described by previous researchers: accessibility, availability, and ease of use. In the interview phase of this study, students did not mention any psychological needs that influenced them to seek information. This reaffirms the questionnaire findings that pragmatic, rather than psychological, reasons were the motivating factors that influence the choice of informaton source. In describing the efficiency of his information seeking process, one student remarked that, "it isn't what you know, but how you get it".

iii) University of Alberta Library System

The interviewed students were asked what change, if any, the University of Alberta Library System could implement that would facilitate their search for information. The following suggestions were made:

1) The online computer catalogue should contain the entire University library catalogue, rather than from 1973 and on. In addition, the online computer should indicate the status of items. That is, it should indicate which items are on loan, and when they are due back. Also, there should be better subject access via the online computer catalogue.

2) More copies of high demand items.

3) Better call number directions on stacks and shelves.

4) Journals arranged alphabetically, rather than interfiled with the regular books.

Discussion

The majority of the responses focussed on the online computer catalogue. This reveals that students were concerned with access to items. They wanted to be able to find information easily and quickly, facilitated by the use of a computer.

In summary, the findings from the interviews are consistent with those obtained from the questionnaire.

CHAPTER V

SUMMARY

The first chapter of this study presented questions and research hypotheses that were formulated to guide an investigation into the information seeking behavior of first-year and fourth-year undergraduate students in the Faculty of Agriculture and Forestry. A study was designed to provide answers to these questions and research hypotheses. The survey instruments included a questionnaire distributed to the students and critical incident interviews with respondent volunteers. The data collected through these methods were analyzed and formed the basis of the discussion in the data analysis section of this study.

The purpose of this chapter is to outline the major findings of the study, to present conclusions which were drawn from the results, to comment on the general significance of the study, to suggest implications for practice, and to make recommendations for future research.

A. MAJOR FINDINGS

The major findings of this study of the information seeking behavior of first-year and fourth-year undergraduate students in Agriculture and Forestry are as follows.

1) Most undergraduate university students sought some kind of information in order to successfully complete their programs of study. Only 5 students, out of 126 respondents in the study, indicated that they did not seek information for any course requirements.

2) Type of course requirement was significantly related to the type of information source chosen by undergraduate students. The present study shows that students tended to choose a formal source, such as a library, for term papers and seminars, and an informal source, such as a teaching assistant and friend and classmate, for labs and assignments. Previous studies had indicated that students seldomly used the university library. These previous results may be attributed to the fact that the type of course requirement did not require the students to seek information from the university library in order to successfully complete the course requirement. Students in the present study, however, did find it necessary to seek information from the university library in order to complete their course requirement.

3) The university library was considered to be the most important information source by most undergraduate students.

4) Students were most likely to choose the university library as their first source of information. If they were not able to find any information, then they would choose other sources.

5) Some of the information sources chosen by first-year and fourth-year students differed significantly. Fourth-year students more readily chose special and department libraries than first-year students, while first-year students viewed a family member to be signficantly more important than fourth-year students.

6) Almost half of the fourth-year students and a third of the first-year students indicated that they did encounter problems finding information and the majority of these problems centered around the university library.

7) For the most part, the psychological needs that influenced first-year and fourth-year students to seek information were similar. "Getting good

grades" (N1), "personal satisifaction" (N17), and "knowing more about the subjects that interest one" (N5) were among the most influential psychological needs for both groups. However, some significant differences between the motivating needs of first-year and fourth-year students were discovered. Needs which were related to the students' future in the profession were significantly more important to fourth-year students than first-year students in searching for information.

8) Although some psychological needs were significantly related to the choice of some information sources, no strong patterns were evident. The results were scattered across most of the variables.

9) Most students chose information sources mainly because of pragmatic reasons such as access, availability, and selection of material, rather than because of psychological reasons.

10) Previous bibliographic instruction courses did not influence student choice of information source.

11) First year attendance at an academic institution other than the University of Alberta did not influence fourth-year student choice of information source.

B. CONCLUSIONS AND IMPLICATIONS

From the findings of the present study, some general conclusions can be drawn which have implications for professional practice.

1) Students choose their source of information based on the type of course requirement assigned by the professor. Accordingly, academic librarians need to be aware of the course requirements which are assigned by the professors and faculties in order to meet the information needs of the undergraduate students. In addition, faculty-library liaison becomes a very

important aspect in meeting the students' information needs. These principles should be reflected in the university library's collection development policy.

2) The university library is very important to the undergraduate student as a source of information. Librarians, therefore, should continue to promote the university library as an important source of information. The present study suggested that first-year students were not aware of the existence of other special-purpose libraries available; therefore, academic librarians need to introduce students to other libraries, such as department libraries and special libraries, when the university library is unable to satisfy the students' information needs.

3) Although the majority of students had taken a bibliographic instruction course, they still encountered problems in finding information from the university library. Librarians need to be aware of such difficulties and should provide ongoing bibliographic instruction, both formal and informal, that focusses on the student's immediate information needs.

4) Information sources are chosen mainly because of pragmatic reasons such as ease of access, quantity, and type of information available. Some psychological reasons are evident but they do not seem to be as important as the pragmatic reasons. Librarians, therefore, must continue to make information easily accessible to students, as well as providing an extensive selection of up-to-date information. Again, faculty-library liason is important in order for the university collection to reflect the information needs of the students.

5) Allen (1966) discovered that project phase affects the information seeking process, with the inital phase resulting in the majority of information seeking. The present study's critical incident interviews revealed that students are

likely to choose the university library as their first source of information. Academic librarians need to provide services and collections that will satisfy the students' information needs. Librarians, therefore, need to be aware of the information that may have already been gathered by the students in order to direct their search to the proper information sources. In planning and conducting use and user studies, as well as bibliographic instruction courses, academic librarians must be aware of and take into account the differing phases of the students' information seeking process.

C. RECOMMENDATIONS FOR FURTHER RESEARCH

Based on the results of this study and the related literature, some recommendations for further research are suggested below.

1) The present study was limited to students in one faculty in one university setting. Comparable studies might usefully be made in other faculties and academic settings. Larger scale studies might also consider cross-institutional comparisons of the information seeking behavior of undergraduate students.
2) The present study was limited to first-year and fourth-year undergraduate students. Future studies might concentrate on the information seeking behavior of all undergraduate students. Other studies might also focus on graduate student behavior.
3) The present study focused on students during a single term of school. Longitudinal studies are also needed in order to provide a basis for the assessment and identification of trends. It would be beneficial to study one group of students' information seeking behavior as they progress through their undergraduate program, from first-year to fourth-year.

4) Bibliometric studies of undergraduate students' term paper bibliographies may help to shed additional light on their information seeking behavior.
5) The present study's results suggested that psychological needs did not really influence the choice of information source, in contrast to Dunn's (1984) study. Further investigation into this aspect of information seeking is necessary.
6) Studies should be designed in an attempt to understand why students experience success and failure in obtaining information.

Such studies as these are needed to broaden our knowledge of information seeking behavior in the academic environment, with a long-term goal of helping practitioners to enhance the effectiveness of their information services.

REFERENCES

ALA glossary of library and information science. (1983) Young, H. ed. Chicago: American Library Association.

Alderfer, C.P. (1972) Existence, relatedness, and growth: human needs in organizational settings. New York: Free Press.

Allen, T.J. (1966) Managing the flow of scientific and technological information. Cambridge, MA: Massachusetts Institute of Technology Press.

Allen, T.J. (1977) Managing the flow of technology. Cambridge, MA: Massachusettes Institute of Technology Press.

Atkins, P. (1971) A bibliography of use surveys, 1950 - Nov. 1970. London: School of Librarianship, Polytechnic of North London.

Bates, M.J. (1971) User studies: a review for librarians and information scientists. ERIC Document 047-738.

Boone, M.D. (1980) Expectancies and values as predictors of motivation of pre-decisional information search. (Doctoral Dissertation, Syracuse University) Dissertation Abstracts International 42, 435A.

Brittain, J.M. (1970) Information and its users: a review with special reference to the social sciences. New York: Wiley Interscience.

Broadus, R.N. (1980) Use studies of library collections. Library Resources and Technical Services 21(4): 317-324.

Burns, R.W. (1978) Library use as a performance measure: its background and rationale. Journal of Academic Librarianship 4(1): 4-11.

Busha, C.H. & S.P. Harter. (1980) Research methods in librarianship: techniques and interpretation. New York: Academic Press.

Butler, M. & B. Gratch. (1982) Planning a user study: the process defined. College and Research Libraries 43(7): 320-330.

Chen, C. & P. Hernon. (1982) Information seeking: assessing and anticipating user needs. New York: Neal-Schuman Publications Inc.

Christiansen, D.E., C.R. Davis, & J. Reed-Scott. (1983) Guide to collection evaluation through use and user studies. Library Resources and Technical Services 27(4): 432-440.

Davis, R.A. & C.A. Bailey. (1964) Bibliography of use studies. Philadelphia: Drexel University.

Day, J.M. & E. McDowell. (1985) Information needs and use of art and design students. Education Libraries Bulletin 28(3): 31-41.

DeVito, A.J., J. Bogdanowicj, & M. Reznikoff. (1982) Actual and intended health-related information seeking and health locus of control. Journal of Personality Assessment 46(1):63-69.

Dunn, K. (1984) Psychological needs and source linkages in undergraduates information seeking behavior: a factor analytic and multiple correlation study. Unpublished doctoral dissertation, Faculty of the Graduate School, University of Southern California, Los Angeles, California.

Feather, N.T. (1967) An expectancy-value model of information seeking behavior. Psychological Review 74(5):342-360.

Ferguson, G.A. (1969) Statistical analysis in psychology and education. New York: McGraw-Hill.

Fine, S. (1984) Research and the psychology of information use. Library Trends 32(4): 441-460.

Flanagan, J.C. (1954) The critical incident technique. Psychological Bulletin 51(4):327-358.

Ford, G. (1973) Progress in documentation: research in user behavior in university libraries. Journal of Documentation 29(1): 85-106.

Ford, G. (1977) User studies: an introductory guide and select bibliography. Sheffield, England: University of Sheffield.

Friedlander, J. (1973) Clinician search for information. Journal of the American Society for Information Science 24(1): 65-69.

Government of Canada, Canadian Forestry Service. (1985) Canada's forests: fibre for the world. Ottawa: Canadian Forestry Service.

Hall, B. (1986) Patterns of grade 10 student information seeking behavior. Unpublished masters thesis, Department of Elementary Education, University of Alberta, Edmonton, Alberta.

Hardy, A. (1982) The selction of channels when seeking information: cost/benefit vs least effort. Information Processing and Management 18(6): 289-93.

Herner, S. (1954) Information gathering habits of workers in pure and applied science. Industrial and Engineering Chemistry 46(1): 228-236.

Krikelas, J. (1983) Information seeking behavior: patterns and concepts. Drexel Library Quarterly 19(2): 5-20.

Kunz, W. et al. (1977) Methods of analysis and evaluation of information needs: a critical review. Munchen, West Germany: Verlag Dokumentation.

Lane, G. (1966) Assessing the undergraduates' use of the university library. College and Research Libraries 27(4):277-282.

Lewin, K. (1938) The conceptual representation and measurement of psychological faces. North Carolina: Duke University Press.

Lipetz, B. (1970) Information needs and uses. In C.A. Cuadra (Ed.) Annual Review of Information Science and Technology 5. Washington, DC: American Society for Information Science.

Lubans, J. (1972) Nonuse of an academic library. College and Research Libraries 32(5):362-367.

Maslow, A.H. (1954) Motivation and personality. New York: Harper & Row.

Matheson, H.J.C. (1979) Information seeking behavior and attitudes to information among education practitioners. Unpublished doctoral dissertation, Faculty of Education, University of British Columbia, Vancouver, British Columbia.

Menzel, H. (1958) The flow of information among scientists: problems, opportunities and research questions. New York: Columbia University, Bureau of Applied Social Research.

Murphy, P.J. (1983) Foreward. Agriculture and Forestry Bulletin 6(2): 3-7.

Murray, H. et al. (1938) Exploration in personality. New York: Oxford University Press.

O'Connor, D.L. (1978) The interactive influences of person and situation characteristics on expectations and their cumulative effect on relevance judgments and file preference choices by undergraduates searching alphabetical and classed subject catalogs. (Doctoral Dissertation, Syracuse University) Dissertation Abstracts International 39, 3198A.

Paisley, W.J. (1966) Information source preference as a function of physical and psychological distance from the information object. ERIC Document 026-101.

Palmour, V.E. (1979) Information needs of Californians. ERIC Document 185-294.

Parker, E.B., W.J. Paisley et al. (1966) Patterns of adult information seeking. ERIC Document 010-294.

Quaglieri, P.L. (1982) A note on variations in recruiting information obtained through different sources. Journal of Occupational Psychology 55(1): 53-55.

Rosenberg, V. (1967) Factors affecting the preference for industrial personnel for information gathering methods. Information Storage and Retrieval 3(3): 119-127.

Rosenbloom, R. & F. Wolek. (1970) Technology and information transfer: a survey of practice in industrial organizations. Boston: Harvard University, Graduate School of Business Administration.

Rotter, J.B. (1966) Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs 80(1): 1-28.

Salasin, J. & T. Cedar. (1985) Information seeking behavior in an applied research/service delivery setting. Journal of the American Society for Information Science 36(2): 94-102.

Scheffé, H. (1959) The analysis of variance. New York: John Wiley and Sons.

Science Council of Canada. (1973) A national statement by the schools of Forestry at Canadian universities. Ottawa: Information Centre.

Smernoff-Lazinger, S. (1984) Tobin's "a study of library use studies" an ERIC update of neglected research. Government Publications Review 11:165-171.

Taube, M. (1959) An evaluation of use studies of scientific information. Emerging Solutions to Mechanizing the Storage and Retrieval of Information: Studies in Coordinate Indexing 5:1-7.

Tobin, J.C. (1974) A study of library use studies. Information Storage and Retrieval 10(3):101-113.

University of Alberta calendar 1988/89. (1988) Edmonton, Alberta: Office of the Registrar, University of Alberta.

Warner, E.S. & A.D. Murray & V.E. Palmour. (1973) Information needs of urban residents. ERIC Document 088-464.

Whitlatch, J. (1983) Library use patterns among full- and part-time faculty and students. College and Research Libraries 44(2):141-152.

Wilson, T.D. (1981) On user studies and information needs. Journal of Documentation 37(1):3-15.

Wood, D.N. (1971) User studies: a review of the literature, 1966-1970. Aslib Proceedings 23:11-23.

Zweizig, D.L. (1973) Predicting amount of library use: an empirical study of the role of the public library in the life of the adult public. (Doctoral Disseration, Syracuse University) Dissertation Abstracts International 34, 6677A.

APPENDIX A

FIRST-YEAR QUESTIONNAIRE

UNDERGRADUATE INFORMATION SEEKING BEHAVIOR QUESTIONNAIRE

1 Thinking back to your courses last semester, for which of the following class requirements did you try to find information? (check as many as apply)

☐ assignments
☐ labs
☐ term papers
☐ exams
☐ seminars
☐ beyond class requirements
☐ other (specify) ____________________
☐ none, did not look for information

2. Of the above, which one did you spend the most time trying to find information for? (please specify) ____________________

3. **For each of the class requirements that you checked in Question 1,** please indicate how important each "Information Source" was in finding information for that class requirement.

VERY IMPORTANT	MODERATELY IMPORTANT	NOT IMPORTANT	DID NOT USE	**ASSIGNMENTS**
1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	____________________
1	2	3	4	____________________
				LABS
1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	____________________
1	2	3	4	____________________

VERY IMPORTANT	MODERATELY IMPORTANT	NOT IMPORTANT	DID NOT USE	**TERM PAPERS**
1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	________________________
1	2	3	4	________________________
				EXAMS
1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	________________________
1	2	3	4	________________________
				SEMINARS
1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	________________________
1	2	3	4	________________________

VERY IMPORTANT	MODERATELY IMPORTANT	NOT IMPORTANT	DID NOT USE	BEYOND CLASS REQUIREMENTS
1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	____________________
1	2	3	4	____________________

OTHER

(please specify only one)

____

1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	____________________
1	2	3	4	____________________

4. From the "Information Sources" in Question 3, which three were the most important to you, and why? Please list in order of importance

1 ____________________

____

2 ____________________

____

3 ____________________

____

5 To what extent did each of the following influence you to look for information last semester?

STRONG INFLUENCE	MODERATE INFLUENCE	NO INFLUENCE	
1	2	3	getting good grades
1	2	3	developing a broader outlook toward life and people
1	2	3	getting everything I can out of my university education
1	2	3	fulfilling personal goals
1	2	3	knowing more about the subjects that interest me
1	2	3	being able to help others
1	2	3	having others think I'm smart
1	2	3	knowing for professional/standardized exams and meeting professional school requirements (ex. GMAT, LSAT, MBA)
1	2	3	competing better in the job market
1	2	3	feeling that my and/or my parents' money is well spent
1	2	3	meeting the expectations of others
1	2	3	feeling good about myself
1	2	3	proving myself to others
1	2	3	becoming a whole person in terms of the mental, physical, and spiritual
1	2	3	avoiding feeling frustrated by a lack of knowledge
1	2	3	having the professor notice and approve of me
1	2	3	personal satisfaction
1	2	3	doing better in upcoming classes
1	2	3	challenging the ideas of the professor and asking more intelligent questions
1	2	3	feeling secure about the future
1	2	3	having a broader understanding of the subjects that relate to my profession
1	2	3	being mentally stimulated and challenged
1	2	3	feeling equal to others

6. During last semester, did you have any problems in finding and getting the information you required?

☐ yes ☐ no

If YES, please specify all problems encountered.

Continue on the back of this sheet if necessary

7 Have you taken any courses, seminars, or lectures on how to find information?

☐ yes ☐ no

If YES, please specify course(s) and institution(s)) ______________

____

Was the course, seminar, or lecture effective in teaching you how to find information?

☐ yes ☐ no ☐ not sure

please elaborate: ______________________________

____

____

____

8. Are you:

☐ male ☐ female

9. Are you:

☐ full-time student ☐ part-time student

10. What year of Agriculture/Forestry are you in?

☐ first ☐ third ☐ other ______________

☐ second ☐ fourth

12. What is your major area of study?

☐ agricultural engineering
☐ animal science
☐ entomology
☐ food science
☐ forest science
☐ general
☐ plant science
☐ pre vet
☐ rural economy
☐ soil science
☐ undecided
☐ other (specify) ______________

13. Have you taken:

a) Ag/For 201 b) Ag/For 204

☐ yes ☐ yes ☐ currently enrolled

☐ no ☐ no

14. Do you have any additional comments or remarks?

____

____

____

____

Please be assured that all responses, both written and verbal, will be kept strictly confidential and no individual will be identified in the final report.

Would you be willing to participate in a brief interview - approximately 15 minutes - to help the researcher gain more insight into the information needs of undergraduate students?

☐ yes ☐ no

If YES, please provide the following:

name ______________________________

phone # ______________________________

best time to call ______________________________

Alix Hayden
Faculty of Library Science
3rd Floor Rutherford South
University of Alberta

APPENDIX B

FOURTH-YEAR QUESTIONNAIRE

UNDERGRADUATE INFORMATION SEEKING BEHAVIOR QUESTIONNAIRE

1 Thinking back to your courses last semester, for which of the following class requirements did you try to find information? (check as many as apply)

☐ assignments
☐ labs
☐ term papers
☐ exams
☐ seminars
☐ beyond class requirements
☐ other (specify) ____________________
☐ none, did not look for information

2. Of the above, which one did you spend the most time trying to find information for? (please specify) ____________________

3. **For each of the class requirements that you checked in Question 1,** please indicate how important each "Information Source" was in finding information for that class requirement.

VERY IMPORTANT	MODERATELY IMPORTANT	NOT IMPORTANT	DID NOT USE	**ASSIGNMENTS**
1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	____________________
1	2	3	4	____________________

				LABS
1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	____________________
1	2	3	4	____________________

VERY IMPORTANT	MODERATELY IMPORTANT	NOT IMPORTANT	DID NOT USE	**TERM PAPERS**
1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	______________________________
1	2	3	4	______________________________

EXAMS

1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	______________________________
1	2	3	4	______________________________

SEMINARS

1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	______________________________
1	2	3	4	______________________________

VERY IMPORTANT	MODERATELY IMPORTANT	NOT IMPORTANT	DID NOT USE	**BEYOND CLASS REQUIREMENTS**
1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	____________________
1	2	3	4	____________________

OTHER

(please specify only one)

____

1	2	3	4	public library
1	2	3	4	special purpose library (e.g. Alberta Agriculture Library, Canadian Forestry Service Library, etc.)
1	2	3	4	departmental library (e.g. Rural Economy Library, Soil Science Library, etc.)
1	2	3	4	University Library (e.g. Cameron, Rutherford, etc.)
1	2	3	4	expert in the field (other than professor)
1	2	3	4	professor
1	2	3	4	teaching assistant (e.g. TA's, grad students)
1	2	3	4	family member
1	2	3	4	friend, classmate
1	2	3	4	personal library (e.g. textbooks, class notes, etc.)
1	2	3	4	bookstore (for books other than class texts)
1	2	3	4	other (please specify all other sources)
1	2	3	4	____________________
1	2	3	4	____________________

4. From the "Information Sources" in Question 3, which three were the most important to you, and why? Please list in order of importance.

1 ____

____

2 ____

____

3 ____

____

5. To what extent did each of the following influence you to look for information last semester?

STRONG INFLUENCE	MODERATE INFLUENCE	NO INFLUENCE	
1	2	3	getting good grades
1	2	3	developing a broader outlook toward life and people
1	2	3	getting everything I can out of my university education
1	2	3	fulfilling personal goals
1	2	3	knowing more about the subjects that interest me
1	2	3	being able to help others
1	2	3	having others think I'm smart
1	2	3	knowing for professional/standardized exams and meeting professional school requirements (ex. GMAT, LSAT, MBA)
1	2	3	competing better in the job market
1	2	3	feeling that my and/or my parents' money is well spent
1	2	3	meeting the expectations of others
1	2	3	feeling good about myself
1	2	3	proving myself to others
1	2	3	becoming a whole person in terms of the mental, physical, and spiritual
1	2	3	avoiding feeling frustrated by a lack of knowledge
1	2	3	having the professor notice and approve of me
1	2	3	personal satisfaction
1	2	3	doing better in upcoming classes
1	2	3	challenging the ideas of the professor and asking more intelligent questions
1	2	3	feeling secure about the future
1	2	3	having a broader understanding of the subjects that relate to my profession
1	2	3	being mentally stimulated and challenged
1	2	3	feeling equal to others

6. During last semester, did you have any problems in finding and getting the information you required?

☐ yes ☐ no

If YES, please specify all problems encountered :

Continue on the back of this sheet if necessary

7. Have you taken any courses, seminars, or lectures on how to find information?

☐ yes ☐ no

If YES, please specify course(s) and institution(s)) ____________

____

Was the course, seminar, or lecture effective in teaching you how to find information?

☐ yes ☐ no ☐ not sure

please elaborate: ____________

____

____

____

8. Are you:

☐ male ☐ female

9. Are you:

☐ full-time student ☐ part-time student

10. What year of Agriculture/Forestry are you in?

☐ first ☐ third ☐ other ____________
☐ second ☐ fourth

11. Did you take your first year of Agriculture/Forestry at the University of Alberta?

☐ yes ☐ no

If NO, specify college/university ____________

12. What is your major area of study?

☐ agricultural engineering
☐ animal science
☐ entomology
☐ food science
☐ forest science
☐ general
☐ plant science
☐ pre vet
☐ rural economy
☐ soil science
☐ undecided
☐ other (specify) ____________

13. Have you taken:

a) Ag/For 201
☐ yes
☐ no

b) Ag/For 204
☐ yes ☐ currently enrolled
☐ no

14. Do you have any additional comments or remarks?

____

____

____

____

Please be assured that all responses, both written and verbal, will be kept strictly confidential and no individual will be identified in the final report.

Would you be willing to participate in a brief interview - approximately 15 minutes - to help the researcher gain more insight into the information needs of undergraduate students?

☐ yes ☐ no

If YES, please provide the following:

name ______________________________________

phone ______________________________________

best time to call ________________________________

Alix Hayden
Faculty Library Science
3rd Floor Rutherford South
University of Alberta

APPENDIX C

ANALYSIS OF DUNN'S (1984) NEED STATEMENTS

The psychological needs that were identified in the present study are listed, followed by the corresponding psychological need taken from Dunn's (1984) study.

N1 Getting good grades.

Need to get good grades
Need to compete with classmates for grades.

N2 Developing a broader outlook toward life and people.

Desire to develop a broader outlook toward life and people.
Need to understand different people and their environments.

N3 Getting everything I can out of my university education.

Need to get everything I can out of my college education.

N4 Fulfilling personal goals.

Need to fulfill personal goals.
Need to be successful in my chosen profession.
A feeling that knowing more may help me make more money.

N5 Knowing more about the subjects that interest me.

A general need to know.
Enjoyment of learning for its own sake.
Need for the excitement and fun of finding answers.
An inner drive to learn more about the subjects that make me curious.
Personal interest in subject of class.

N6 Being able to help others.

Need to know more in order to help others.
Need to know more so that when I have children I can do a better job of raising them.
Need for all the knowledge that I can get so that I can help people better as part of my chosen profession.

N7 Having others think I'm smart.

Need to have my friends think I'm smart.
Need to have the teacher think I'm smart.
Need to have classmates think I'm smart.

N8 Knowing for professional/standardized exams and meeting professional school requirements (eg. GMAT, LSAT, MBA)

Need to know in order to meet professional school requirements.
Need to know for upcoming professional/standardized exam.

N9 Competing better in the job market.

Need to meet requirements for employment in chosen profession.
Need to be well prepared for chosen profession.
A desire to compete better in the job market.
Need to know a wide variety of things so that I can feel secure in terms of the job market.

N10 Feeling that my and/or my parents' money is well spent.

Need to get my money's worth.
Need to feel that my parents' money is well spent.

N11 Meeting the expectations of others.

Need to meet parent's expectations.
Need to produce quality material because others expect it of me.

N12 Feeling good about myself.

A desire to work as hard at my studies as my friends in order to feel good about myself.
A feeling that I don't have many talents, but that I can be somebody by knowing more than others.
Need to avoid unpleasant consequences like being putdown.
The desire to know and understand in order to feel better about myself.
A feeling that knowing more may help me solve complex job-related anfd personal problems in the future.

N13 Proving myself to others.

Need to prove myself to my family.
Need to prove myself to my husband/wife or boyfriend/girlfriend.

N14 Becoming a whole person in terms of the mental, physical, and spiritual.

Need to become a whole person in terms of the mental, physical, and spiritual.
Need to know more about God.

N15 Avoiding feeling frustrated by a lack of knowledge.

Need to avoid feeling frustrated by a lack of knowledge.
A feeling of insecurity when I think I should know something but I don't.

N16 Having the professor notice and approve of me.

Need to compete with classmates for teacher's approval.
Need to have teacher notice me.

N17 Personal satisfaction.

Personal satisfaction.
Need to feel that I have done and am doing the best that I can.
Need to push myself to know more.
Need to feel well-rounded in terms of what I know.
Need to live up to my expectations.
A feeling that knowledge offers me more control.

N18 Doing better in upcoming classes.

Need to know in order to do better in upcoming classes.
Need to understand basic content of the course.

N19 Challenging the ideas of the professor and asking more intelligent questions.

Need for additional knowledge about class in order to challenge the ideas of the teacher.
Need to do more work for class so that I can ask more intelligent questions.

N20 Feeling secure about the future.

Need to feel secure about the future.

N21 Having a broader understanding of the subjects that relate to my profession.

Desire for more information about my major.
Need to have a broader understanding of the subjects that relate to my profession.

N22 Being mentally stimulated and challenged.

Need for mental stimulation and challenge.
Need to feel intelligent.

N23 Feeling equal to others.

Need to know as much about the subject as my friends.
A need to do more than is required for the class so that I can feel equal to my classmates.

APPENDIX D

COVERING LETTER

Faculty of Library Science
3rd Floor Rutherford South
University of Alberta

Dear fellow student,

The attached questionnaire is part of my graduate thesis in the Faculty of Library Science at the University of Alberta.

The purpose of the questionnaire is to gather data on what sources of information undergraduate students in the Faculty of Agriculture and Forestry use in order to satisfy their information needs for their academic degree program. In addition, the study will attempt to highlight the motivations that influence students to seek information.

Please take a few minutes now to respond to the questions on the following pages. It should take no more than 10 minutes of your time to answer. **When you have completed the questionnaire, hand it in to the researcher.**

While none of the questions for this survey are of a personal nature, please be assured that all responses will be kept strictly confidential and no individual will be identified in the final report. A summary of the results will be available in the General Office at the completion of the study.

Thank you for your assistance with my research.

Sincerely,

Alix Hayden
Graduate Student
Faculty of Library Science

This questionnaire has been approved by Dr. A. Schrader, Associate Professor, thesis supervisor. If you have any questions or comments, please contact Dr. Schrader at 432-4578/4719.

APPENDIX E

PRETEST QUESTIONS

PRETEST QUESTIONS

1. Did you have any problems with the questionnaire?

2. Were there any parts that you didn't understand, or that need explantation?

3. Were there any parts that required you to think hard for answers? Why?

4. Were there any questions where you had to guess in order to provide a response?

5. Did any of the questions embarrass or irritate you?

6. Were there any questions whose wording you found awkward or that used words that seemed strange to you, not the kinds of words or phrases that people commonly use?

7. Did you have any trouble in following the sequence of questions?

8. Were there any places where there wasn't enough room to write in the answers?

9. Were there any semi-open or close-ended questions where the list of answers was not complete or categories were not clear?

10. Do you think that it is okay to have a name attached to the finished questionnaire, guaranteeing confidentiality?

11. Is the layout, design, format, and type clear and easy to read?

12. What is your overall impression of the questionnaire?

APPENDIX F

REVISED COVERING LETTER

Faculty of Library Science
3rd Floor Rutherford South
University of Alberta

Dear fellow student,

The attached questionnaire is part of my graduate thesis in the Faculty of Library Science at the University of Alberta.

The purpose of the questionnaire is to gather data on what sources of information undergraduate students in the Faculty of Agriculture and Forestry use in order to satisfy their information needs for their academic degree program. In addition, the study will attempt to highlight the motivations that influence students to seek information.

Please take a few minutes now to respond to the questions on the following pages. It should take no more than 10 minutes of your time to answer. **When you have completed the questionnaire, hand it in to the Students' Record Office, Room 2-19, Agriculture and Forestry Building, by February 12, 1988.**

While none of the questions for this survey are of a personal nature, please be assured that all responses will be kept strictly confidential and no individual will be identified in the final report. A summary of the results will be available in the General Office at the completion of the study.

Thank you for your assistance with my research.

Sincerely,

Alix Hayden
Graduate Student
Faculty of Library Science

This questionnaire has been approved by Dr. A. Schrader, Associate Professor, thesis supervisor. If you have any questions or comments, please contact Dr. Schrader at 432-4578/4719.

APPENDIX G

MAIL-OUT COVERING LETTER

Faculty of Library Science
3rd Floor Rutherford South
University of Alberta

Dear fellow student,

The attached questionnaire is part of my graduate thesis in the Faculty of Library Science at the University of Alberta.

The purpose of the questionnaire is to gather data on what sources of information undergraduate students in the Faculty of Agriculture and Forestry use in order to satisfy their information needs for their academic degree program. In addition, the study will attempt to highlight the motivations that influence students to seek information. The study's results will help to improve library service to the students in the Faculty of Agriculture and Forestry.

Please take a few minutes now to respond to the questions on the following pages. It should take no more than 10 minutes of your time to answer. **When you have completed the questionnaire, bring it to the University and hand it in to the Students' Record Office, Room 2-19, Agriculture and Forestry Building, by March 2, 1988.**

While none of the questions for this survey are of a personal nature, please be assured that all responses will be kept strictly confidential and no individual will be identified in the final report. A summary of the results will be available in the General Office at the completion of the study.

Thank you for your assistance with my research.

Sincerely,

Alix Hayden
Graduate Student
Faculty of Library Science

This questionnaire has been approved by Dr. A. Schrader, Associate Professor, thesis supervisor. If you have any questions or comments, please contact Dr. Schrader at 432-4578/4719.

APPENDIX H

INTERVIEW SCHEDULE

May I speak to ______________________________

This is Alix Hayden. I am from the Faculty of Library Science. During February I distributed questionnaires to your class regarding information and library use.

On the questionnaire you indicated that you would be willing to participate in the interview phase of my research. I realize that it is close to finals and it is a very busy time of year, but would you be able to discuss your answers to the questionnaire in greater detail right now. It should only take 10 minutes at the very most.
(If can't discuss right now, arrange a convenient time)

You stated that you spent the most time trying to find information for *course requirement* last term.

Do you remember if you had a particular *course requirement* in mind, or was it *course requirements* in general?

(If unable to remember the course requirement from last term, ask them to choose one from this term that they think they spent the most time trying to find information for)

a) I would like you to focus on this particular *course requirement*
b) try to focus on only one of the *course requirement*
during the following discussion.

I would like you to recall what steps you took in order to find the necessary information for *course requirement* .

In other words, please recall exactly where you went first to find the necessary information, and why it was your first choice?

probes for sources
- libraries
  (public special depart univ)
- expert
- professor
- T.A.
- family member
- personal library
- bookstore
- other

probes for reasons
- convenience of location
- has necessary information
- easy to use (familiar with)
- broad range of information
- specific information available
- personal insight
- helpful
- recentcy of materials
- relevant material
- etc (based on comments from questionnaires)

Did you find the necessary information here, or did you have to go to another source?

If information wasn't found in the first location ask - Why do you think you weren't able to find the necessary information there?

probes for reasons
- materials taken out, missing, limited availability
- material too old
- material too recent
- didn't know how to use
- material too complex
- material too simple
- no information on topic
- etc (based on problems from questionnaires)

What did you do next? Did you go anywhere else? Why did you go there next?

(Keep asking the above questions until the whole information seeking process has been completed)

Do you think that you were able to get all the information that you needed, or were there gaps and holes in the information you found, even though you consulted (more than one, several) information source(s)?

Do you have any other comments regarding your search for information for this or any other course requirements?

Thank you for participating in both the questionnaire phase of my research and this interview. Your input is very valuable.

APPENDIX I

IDENTIFIED PSYCHOLOGICAL NEEDS

LIST OF PSYCHOLOGICAL NEEDS FROM THE PRESENT STUDY

N1 Getting good grades.

N2 Developing a broader outlook toward life and people.

N3 Getting everything I can out of my university education.

N4 Fulfilling personal goals.

N5 Knowing more about the subjects that interest me.

N6 Being able to help others.

N7 Having others think I'm smart.

N8 Knowing for professional/standardized exams and meeting professional school requirements (ex. GMAT, LSAT, MBA)

N9 Competing better in the job market.

N10 Feeling that my and/or my parents' money is well spent.

N11 Meeting the expectations of others.

N12 Feeling good about myself.

N13 Proving myself to others.

N14 Becoming a whole person in terms of the mental, physical, and spiritual.

N15 Avoiding feeling frustrated by a lack of knowledge.

N16 Having the professor notice and approve of me.

N17 Personal satisfaction.

N18 Doing better in upcoming classes.

N19 Challenging the ideas of the professor and asking more intelligent questions.

N20 Feeling secure about the future.

N21 Having a broader understanding of the subjects that relate to my profession.

N22 Being mentally stimulated and challenged.

N23 Feeling equal to others.